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Video Beat: Piloting to Earth 2 13

Quick Cuts: Time Passages 19

Commercial Spot: Cola Bears 27

Quick Cuts: Shadow World 33

Commercial Spot: Light and Liberty 39

From Zero to Hero 46

An ancient artifact – aided by Cannom Creations makeup and effects from Industrial Light & Magic and Dream Quest Images – turned actor Jim Carrey into a manic cartoon in *The Mask*. *Article by Jody Duncan.*

Haunting Creation 70

With creature makeups by Daniel Parker and effects by Richard Conway and Computer Film Company, director Kenneth Branagh captured the essence of *Mary Shelley's Frankenstein*. *Article by Mark Cotta Vaz.*

Making Gump Happen 90

To recreate some pivotal moments in recent American history, *Forrest Gump* director Robert Zemeckis enlisted Industrial Light & Magic to provide the subtlest of digital illusions. *Article by Janine Pourroy.*

Video Beat: Attack of the 80-Foot Stones 111

Quick Cuts: The Return of the Vampire 117

Video Beat: Casting Another Spell 123

Commercial Spot: Byte-Size Cookies 129

COVER – A man-made being ponders his origin in *Mary Shelley's Frankenstein*. (Photograph by David Appleby.)

VIDEO BEAT
PILOTING TO EARTH 2

article by Bill Norton

Earth 2 – the latest Amblin Entertainment television series for NBC – follows the adventures of colonists from a lethally polluted future earth as they struggle to establish themselves on a new planet. While subsequent episodes will be planet-bound, the series' pilot chronicles the initial voyage to the stars. Escaping an earth which has become so toxic it has made their children ill, the colonists procure a cargo transport spacecraft and enlist the aid of a freelance pilot with a faster vessel which is sent ahead as an advance ship. Though both ships manage to escape an orbiting space station at the start of the expedition, the advance craft burns up as it attempts to land on the new planet. The first season of Earth 2 relates the struggles of the advance crew – which escapes the burning ship in emergency descent pods – to prepare for the colonists' arrival with what little hardware has survived.

With its ambitious storyline, the pilot required considerable visual effects support. Seeking a gritty, photorealistic approach utilizing traditional techniques augmented by digital tools, executive producer Tony To recruited Dream Quest Images for the assignment. Under the supervision of effects supervisor Mike Shea, Dream Quest was tasked with producing twenty-seven miniature and twenty-five digital shots. Miniatures would be used for scenes featuring the two spaceships and the space station launch, while matte paintings, wire removals and compositing would be achieved digitally.

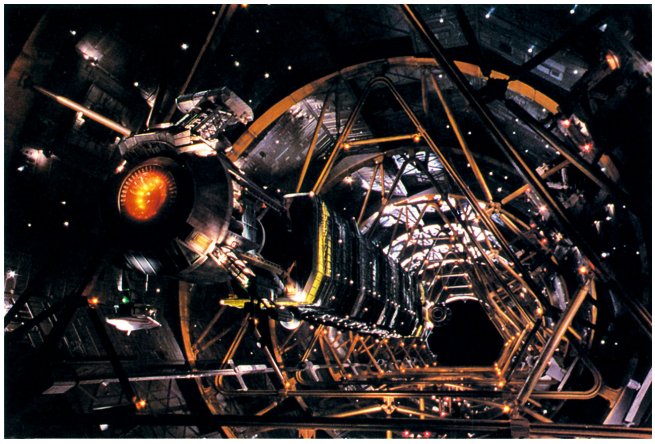
Faced with a tight production schedule that included location photography near Santa Fe, New Mexico, Dream Quest joined the project early on. "We spent two months in preproduction meetings before the show went on location," Shea recalled. "I was already three weeks into shooting before live-action even began. Ordinarily my job is to match the look that the director of photography has established; but in this case, we really turned the tables. I was sending production clips of our shots and they had to match us. Tying miniatures to live-action footage is fairly easy; but when you shoot the miniatures first, it can get pretty hairy. Fortunately, the flexibility offered by digital tools helped, as it enabled me to do a lot of scaling and lighting changes after the fact."

Essential to the pilot were the two spaceships – the large colony vessel and the smaller advance ship – which were conceived in sketches by production designer Victoria Paul and her team. "They were going for a kind of rented barge look – as if the ships had been put together piecemeal over centuries," noted Shea. In order to minimize the need for custom fabrication – and because it was in keeping with the piecemeal design – model shop supervisor David Goldberg revised the sketches to incorporate model parts and molds already on hand from previous projects. Skeletal aluminum armatures were fabricated in the required shapes, then detailed with cast urethane. Both models were built in 1/150th scale, with the colony ship measuring nine feet in length and the advance ship about three-and-a-half feet. "That was a bit smaller than I would have liked for the advance ship; but using the same scale enabled us to shoot the two ships together in the same shot."

Because digital matte paintings were to be used for establishing shots, the only miniature set required was the space station launch tube and port door featured during the sequence in which the colony ships evade authorities in a hair-raising escape into space. “We have shots of the two ships rushing down the tube and a lot of foreground bluescreen POVs out windows,” Shea noted. “The tube wall was built on a five-by-seventeen-foot masonite board, every inch of it covered with cast detail. We built foreground elements and other bits and pieces of the space station itself; but the rest was a digital matte painting. Rather than paint just one angle, we created a 3-D computer model of the station and texture-mapped it so that we’d have the geometry no matter what angle the production wanted.”

Miniatures and digital matte paintings were employed by Dream Quest Images to create visual effects for the Earth 2 teleseries pilot.

Working with motion control supervisor Scott Beattie and motion control operator Kevin Fitzgerald, Shea mounted the set on Dream Quest’s gantry stage and used a camera on an overhead track to photograph the miniature ships on floor-mounted tracks. “With a single camera we could shoot these different-sized miniatures without later tracking, because we knew the camera rig would react the same way every time. All we had to do was some simple math to adjust for scale differences. By letting the ships do most of the moving, we were able to give the CGI guys a distilled camera move which they could use to create a camera in their computer that worked just like ours. So all the background paintings for the shots – starfields or views of the earth – were done using only our camera data. Nothing had to be tracked.”



Two ships carrying interstellar colonists prepare to depart an orbiting space station.

After the ships escape from the station, the colonists discover that a bomb has been hidden on board one inside a television set. The television is promptly jettisoned, but continues to play as it tumbles toward camera and finally explodes. The sequence was executed entirely by a seven-person computer graphics team under the supervision of Tim Landry. “To get the shot traditionally,” said Shea, “we would have had to stick a rod in a television set to spin it, using video playback to get the image on the screen. We thought it would be easier to model the television in CG, texture-mapping the footage they wanted onto the screen.”

The second half of the miniature photography effort entailed creating the fiery demise of the advance ship – the result of an accident which occurs as its cargo containers are being released. When the containers become snagged on the ship’s landing gear and fail to drop, the added weight

disrupts the descent and the craft is destroyed in a blazing passage through Earth 2's atmosphere. The sequence required the construction of several cargo container miniatures – including one that was three times the scale of the advance ship for closeups – and a miniature emergency pod.

For a shot of the advance ship burning up, Dream Quest photographed two frontlit passes on the ship model. "We used nitrogen lit with orange gels and lots of diffusion," Shea explained, "We also came up with a couple of unusual ideas to enhance the effect. We taped one- to two-foot-long strips of tissue paper all over the appendages of the ship, then used big fans to blow the streamers up and away while we shot long exposures. The edge of the tissue paper was very kinetic and produced a flame-like flicker. I handed that footage off to the CGI crew and they used a beta program developed by CoSA After Effects to streak these elements with some interference patterns running through them. That gave us a trail of fire as the ship falls toward the planet.

"For another enhancement, the model was blacked off and I stood behind it animating little pieces of translucent scotch tape. When you hit that stuff with edge lighting, it acts like a soft gel. Wherever there was some protruding detail, I put tape on it for eight to twelve frames, moving it around a bit, making it bigger, then smaller, then taking it off. When I removed the tape, I snapped a bit of detail off, too; so when we streaked that element, we got little flames, as if bits of debris pulled off and burned up really quickly." The planet background featured in the shots was achieved as a digital matte painting.

While the pilot showcased traditional model photography, CGI will carry the major workload for the remaining episodes. The second hour of the pilot foreshadowed the kind of effects the digital team will be doing throughout the series. Digital matte paintings, for example, were employed to enhance the alien planet's topography. In addition, alien lifeforms – realized on location with animatronic puppets produced by Cannom Creations – relied on digital tools for the removal of puppeteering rigs and wires. The pilot also featured a robot holding its head in its hands, a shot which entailed rotoscoping the head of the actor performing inside the Cannom robot suit.

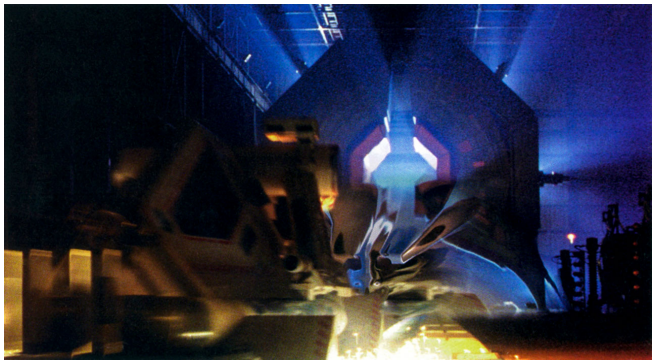
For Dream Quest, Earth 2 offered a different challenge than that presented by feature work. "When you're dealing with a feature," stated Shea, "if the director is happy, then the work is done. But in television there is a much deeper echelon of creatives. That leaves you with a screening room full of people trying to decide whether or not your shot is finished. For us, the real challenge was getting a large number of shots done in a really short time period – and doing them well."

QUICK CUTS
TIME PASSAGES

article by Estelle Shay

Ever since Rod Taylor propelled himself into the grim world of the Eloi and the Morlocks in *The Time Machine*, filmmakers have been fascinated with the concept of traveling through time. Now *Timecop*, a futuristic action thriller from Universal Pictures and Largo Entertainment, lends a decidedly modern treatment to this classic science fiction theme. Directed by Peter Hyams, the story opens in present-day Washington D.C., but quickly moves to the year 2004 where time travel is a reality. Confronted with a new breed of criminals who threaten the future by tampering with the past, the government has banned unauthorized time travel and established a Time Enforcement Commission to police violators. TEC agent Max Walker (Jean-Claude Van Damme) uncovers a plot by unscrupulous senator Aaron McComb (Ron Silver) to exploit the technology in order to finance his bid for the presidency. Pursuing McComb back to 1994, Walker confronts his own tragic past – the murder of his wife Melissa (Mia Sara) by the senator's time-traveling henchmen.

Overseeing Timecop's visual effects was VIFX, a company organized by the founding partners of Video Image. Effects supervisor Greg McMurry welcomed the opportunity to collaborate once again with Hyams. "Our association with Peter began exactly ten years ago when we formed Video Image and worked with him on *2010*. Since then we've been involved in almost all of his pictures." Of primary concern to McMurry and Hyams was the need to create a believable time travel effect that could propel the film's characters back and forth between past and present. "Peter had a very clear concept of how he thought the effect should look. He likened it to a transparent curtain extending across a room that can only be detected once it begins to move and distort what's on the other side. Then it starts to take the shape of the time traveler as he slowly pushes through it into the new time zone. The curtain stretches and extends until eventually the time traveler tears through."



A time pod rockets into the past in Timecop, a futuristic thriller with visual effects by VIFX.

With the script calling for twelve time travel shots, McMurry and Hyams sought an approach that would require only minimal disruption of the live-action shoot. "We wanted the shots to look like they were in the environment," observed McMurry, "and Peter was also looking for economical ways to execute the photography. So we decided to shoot all of the bluescreen and greenscreen work right on the set by using portable screens and motion control systems. That approach also enabled us to take advantage of existing lighting, without having to reconstruct it later in a bluescreen shoot. Peter tends to use very dramatic lighting, tailored specifically for the environment in which he is shooting." Hyams' propensity for fluid camera moves also had to be accommodated. "Peter doesn't like to put the camera in one spot and have his actors walk around it. To him, the camera is almost like another

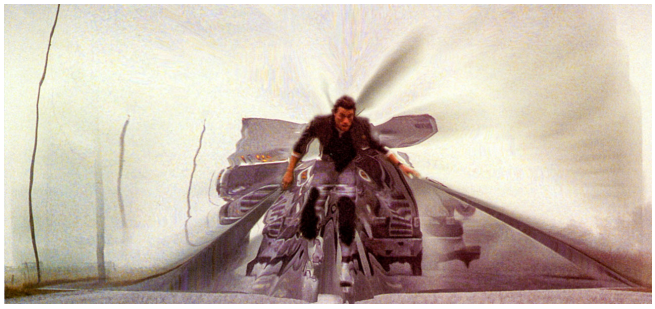
actor. So we had to come up with techniques for shooting that would keep the camera moving. There are very few locked-off cameras in the time travel effects for this film."

Most of the background plates and live-action footage for the time travel effects were filmed on location in Vancouver, where the production was based. Simplest in form was a shot early in the film in which Walker transports back in time to 1929 in pursuit of his TEC partner who has turned outlaw at the prospect of making a killing in the crashing stock market. Preceded by the signature ripple that is the time travel effect, Walker suddenly appears inside the man's *Wall Street* office. Because of the stationary nature of the shot, McMurry and crew were able to shoot a pass of the office set without Van Damme, and then a pass with Van Damme – both with a locked-off camera. "All I really needed was a good, clean background plate so that I could make Van Damme appear or disappear in the shot," explained McMurry. "We had the camera locked off and we shot the office set for several seconds. Then Van Damme just stepped into the shot and stopped for a second before walking forward."

For a shot in which Walker and Internal Affairs officer Sara Fielding (Gloria Reuben) – returning to 1994 to investigate a ripple in the time continuum – splash down in a tidal basin near the Jefferson Memorial McMurry set up a crane on Vancouver Bay to photograph the live-action. "We had to find a location where the sun was hitting at just the right angle to match the location we had previously scouted for a background shot of the Jefferson Memorial. We suspended two stunt people from the crane over the water and filmed them jumping in." McMurry later led a second unit to Washington D.C. to film the memorial, then composited the two plates into the sequence.

On another jump into the past, Walker lands in the center of a highway, directly in the path of an oncoming truck, and drops to the pavement just seconds before the vehicle barrels over him. “That was another instance where composites were required for the background,” said McMurry. “To get our shot of the oncoming vehicle, we built a mount for the camera and literally drove a truck over it. Then we went back to the same place and filmed Van Damme standing against a greenscreen as if he had just time-traveled through.”

With background plates in hand, McMurry turned to his computer graphics team – headed by John Des Jardin – to devise the effect that would suggest the time travel transition between plates. “All of the time travel shots required digital manipulation to create the curtain Peter envisioned,” McMurry commented. “When we were shooting the background plates and live-action, we documented things like camera placement, angle of the lens and placement of set pieces so that they could be recreated in a 3-D computer environment. Using Prisms modeling software, we also built a three-dimensional wire-frame grid to represent the curtain and little 3-D wire-frame figures to represent our actors. Then we tracked the movements of the figures frame by frame to the live-action in order to collide them with our computer generated curtain.” Although a generic human database was used for most of the wire-frame figures, there were occasional exceptions. For a scene in which McComb journeys back in time to prevent his younger self from botching an investment that will cost him millions, the renegade senator’s head and shoulders appear very large in the frame as he pushes through the curtain. “Because it was such a closeup, we had to take a lifemask of Ron Silver and digitize it so that the shape of the face coming through would resemble him.”



Agent Max Walker is transported through time into the path of a speeding truck.

A greenscreen element of actor Jean-Claude Van Damme was inserted into a digitally stretched plate.

Developing software to interface with Prisms, VIFX digital artists created a distortion effect based on the interaction of the transparent curtain and the figure passing through it. “As the time traveler comes through, the first thing you see is a bulge in the curtain,” noted McMurry. “We pinned down points in our geometric grid around the collision site so that the curtain would stretch. Whether it stretched all

the way to the edges or just in the center depended on the composition of the shot. If we had a character time-traveling in a quarter of the frame, we might choose to have the effect be stretched longer as opposed to wider. In the case of the truck shot, where Van Damme lands squarely in the middle of the frame, we chose to stretch it almost to the edges."

A greenscreen element of actor Jean-Claude Van Damme was inserted into a digitally stretched plate.

In the next phase of the time travel effect, a transparent image representing the body of the time traveler begins to take shape. "We called that 'the glassman,' where this clear shapes starts to emerge from the curtain. Finally the fully realized image of the body tears through completely." Just as stretching of the imagery was determined on a shot-by-shot basis, the tearing-through effect was customized to fit each particular occurrence. "On each shot, we would decide how many frames it would require to tear through. That portion of the shot we then rotoed, determining what sections of the body would come through first in the final frames. It was the only part of the process that was not automated."

The truck shot provided the lead in developing the time travel effect. "In a way, it was fortuitous that we started with that particular shot," McMurry observed, "since it essentially set the standard for all the others. It turned out to be technically quite demanding because the sequence was filmed on a foggy, misty day, and there was very little in the background other than gray sky and a few seconds of the oncoming truck. We compensated by adding other textures to the surface of the curtain – like ripples and stretch marks. Then we developed the concept of using shading and shadows and highlights on the ripples rather than just distortion. We found that by experimenting with different lights on our modeling we could put shadows on one side of a ripple and highlights on the other." Another element added was a kind of recoil effect that would occur in the curtain when the time traveler broke through, creating a wave that emanated behind him.

With virtually dozens of elements entering into the equation, every time travel shot required individual massaging. "Initially we thought that once we hit on the effect, we would simply be able to replicate it for each sequence," McMurry stated, "but that was absolutely not the case. Besides just balancing in the foreground and background elements, there were so many variables that influenced the degree of distortion that we ended up doing pass after pass after pass on each shot – trying different versions, adjusting and tweaking before we would get the results we wanted."

Senator Aaron McComb (Ron Silver) steps into the past to alter history.

Another crucial effect undertaken by the VIFX team was a series of elaborate twin shots featured in scenes during which Walker and McComb encounter younger versions of themselves. "We asked Peter to tell us how he would shoot those sequences if he actually had two Van Dammes or two Ron Silvers at

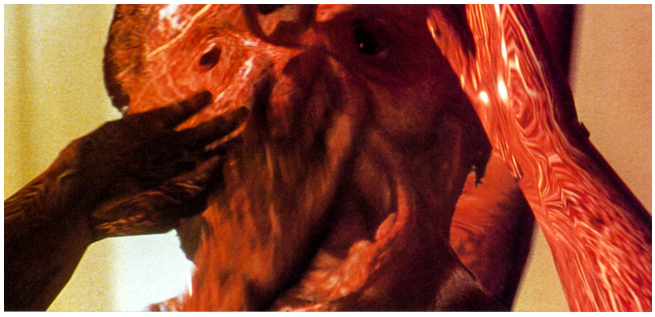
his disposal," McMurry recalled. "We encouraged him to shoot that way. As a result there is very little use of doubles or locked-off cameras in those shots. Virtually all of them required camera moves and motion control."

McComb meets his younger self via on-set motion control and digitally composited traveling mattes.

Chief among the twin shots are two occurring in the sequence where McComb returns to 1994 to warn his younger self about a bad business move he is about to make. "Peter wanted to tease the audience by fooling them into thinking we were using a double," said McMurry, "so the sequence begins with a full shot of Ron Silver, as the younger McComb, filmed from over the shoulder of his older twin. As the older McComb turns toward camera, we see that he, too, is Ron Silver, not a double." As the shot proceeds, McComb slowly walks around his younger self, passing both in front of and behind him. Three fifty-second motion control passes were required to achieve the effect. "One is a background shot that includes some of McComb's bad guys who are also in the scene. The other two passes are greenscreen shots – one with the older McComb and one with the younger McComb. We shot an initial video reference piece with Silver, the bad guys and a double, to give us an idea of what we were going for." On-set video was also used to choreograph the action. "We superimposed Ron Silver over the double on video to ensure that Ron was in the right position and was walking at the right pace. We used traveling mattes throughout the sequence to composite the greenscreen elements into the final shot."

A second twin shot occurs when McComb drops an envelope containing instructions for future success into the hands of his younger counterpart. "That shot also required three passes and was even more elaborate, with the camera moving constantly. The first pass was Ron Silver as the young McComb, receiving the envelope from a double. Then we split out the double in a clean pass – all except the arm holding the envelope. Next we did a pass with Ron as the older McComb handing over the envelope. For that shot, I was literally down on the floor with a video monitor making sure he was positioned in exactly the right spot for his arm to connect up with the double's arm." Clever editing disguised the transition from Silver's arm to the double's. "When McComb first holds out the envelope, what you see is Ron Silver's arm. Then he puts it down for a moment; and when it comes back up, it's actually the double's arm."

Several other twin shots occur when Walker returns to 1994 in a last-ditch effort to bring back evidence of McComb's deceit. Upon discovering that his wife was pregnant at the time she was murdered, Walker intercepts her at a shopping mall where she has gone to meet his younger self on the day of her death. He then observes the young Walker arrive to enact an eerie replay of the film's opening scene. A complex twin shot in the sequence required a focus shift between the two Walkers as they pass each other in the crowded mall. Directly preceding it was a thirty-second motion control dolly move that culminated in a seamless dissolve to a split-screen. "One of the successful aspects of the shot is that we were able to keep the background crowd in the right positions," noted McMurry, "which was necessary since we were relying on a focus pull to cross-dissolve from the first to the second shot. The people in the background had to get into position and be there at the point where the dissolve occurs. We relied on video to help us get it exactly right."



When thrust into the same space in time, the two McCombs metamorphose into a gelatinous blob – an effect achieved by morphing betwen three manually articulated puppet heads.

Determined to change the outcome, Walker returns to the scene of his wife's murder. In another elaborate twin shot, he rescues his younger self from the stranglehold of one of McComb's thugs, coming from behind to grab the assailant, spin him around and deliver a knockout blow. "That scene was particularly demanding," McMurry recalled, "because it required shooting at night in the rain. We used our video system to line up the shot and operate the motion control camera as well. After first rehearsing with a double, we filmed the foreground pass against a greenscreen with Van Damme as the young Walker, shooting it by counts, using the video to provide a time code count. For the background pass, Van Damme switched into his older makeup while we removed the greenscreen and replayed the video to see exactly where we needed to position him in order for his punch to appear to connect. When we ran the second pass, we could superimpose the video and the camera move to make sure everything lined up." The actor's martial arts training proved a real asset to getting the shot. "Van Damme had an incredible ability to place his body precisely where we wanted it. We would tell him to punch a spot in the air; and after rehearsing it twice, he'd hit it perfectly every time. He was like a machine."

A deadly confrontation between Walker and McComb presented VIFX with one final effects challenge. Having dispatched his would-be assassins, Walker returns to his house to discover Melissa in the clutches of McComb. The senator's plans go terribly awry, however, when the younger McComb appears, giving Walker an opportunity to test the one immutable rule of time travel – that two bodies cannot occupy the same space in time. As Melissa wrenches free, Walker shoves McComb into his twin and a terrifying metamorphosis begins. "There was a lot of discussion regarding the end sequence,"

McMurry revealed. "We wanted to show the two bodies drawn together despite their efforts to pull apart – like the comic routine of getting your hand stuck on fly paper, where you put your other hand out to free yourself and end up getting stuck even worse." The effects team settled on a combination of morphing and modeling to achieve the transformation. "We didn't want to do a

straight, all-synthetic morph because we thought it would look too artificial. We were also concerned about losing resolution as the morph caused sections of the image to stretch. So we sculpted three separate stages of rubber heads, each representing a different level of transformation, filmed them and then used morphing to connect the stages together." During filming, puppeteers inserted their hands inside the heads to stretch and contract them for a more organic look.

In the final stages of the metamorphosis, a computer generated meltdown blob was given an organic look with texture maps that were created from sculpted pieces painted to look like the underside of skin. "We also put little distortions, warps and ripples into the rendering of the final meltdown because we felt that even though it was catastrophic, the effect should relate somehow to our time travel effect." For maximum impact, Peter Hyams instructed that the meltdown be filmed as one continuous shot – with just a brief cutaway to Walker and Melissa for a reaction.

The demise of McComb in 1994 fundamentally alters the circumstances of Walker's life in the year 2004. As Timecop concludes, Walker returns home, discovering to his delight that home now includes not only his wife Melissa, but a ten-year-old son. Working on several levels – as love story, action picture and futuristic fable, Timecop offered effects sequences that were fantastic, yet imbued with a sense of realism. "It's something new that we're beginning to see in this genre," observed McMurry, "and it guided our approach to the effects. We did not want them to look so fantastic or be so blatant that you couldn't accept the basic premise of the movie – which is that time travel is real. So we underplayed the fantasy aspects of the film and tried to treat them sort of nonchalantly. We wanted to maintain that subtle connection to reality – and I think we succeeded."

COMMERCIAL SPOT
COLA BEARS

article by Phil Carpenter

Artfully stylized polar bears shuffle across an arctic landscape, jostling and bumping against each other amiably. They come to rest, looking expectant. Suddenly, the night sky comes ablaze with a fiery aurora borealis. Displaying appropriate expressions of awe and delight, the bears toast the spectacle by swigging Coca-Cola.

To bring this imaginative concept into being, Creative Artists Agency and Sierra Hotel Productions presented Rhythm & Hues Studios – a Hollywood computer graphics and production house – with preapproved storyboards and a preliminary design for the bears. "For the most part, the bear was already fleshed out – pardon the pun – and our job was to produce what the agency had designed," stated Rhythm & Hues' production manager David Weinberg.

Animation director Henry Anderson and technical director Pauline Ts'o headed the Rhythm & Hues team. A sculpture of the bear was created by freelance modelmaker Greg Smith. "Greg sculpted one head and one body," noted Ts'o, "each about a foot square in size. The storyboards had roughed out the look of the bear; but our sculpture was the final say in how it was going to look – the proportions of it, its expression, that sort of thing. We have found that many clients relate better to an actual sculpture than to a wire-frame model."

A 3-D digitizing tablet was used to recreate the sculpture in the computer. "We drew a grid over the sculpture and then plotted each point with a digitizing pen," Weinberg related. Although most of Rhythm & Hues' software is developed in-house, the computer modeling was assisted by a software package developed by Thomson Digital Image, now a division of Wavefront. "All of our software is polygonally based," said Ts'o, "but there are some objects that are more easily done with spline surfaces – and that's what we used TDI for."

To aid in the animation of the bears, technical directors studied videotapes of real bears in action. Low resolution wire-frame models representing the animals' skeletons were then animated on Silicon Graphics Indigo workstations. "Because our hero model had tens of thousands of polygons," noted Ts'o, "it would have been very difficult to try and animate that database. So we animated using a simplified database that we could manipulate in real time. It was like a rod framework that represented the skeleton of the bear." A hierarchical type of animation was used to articulate that framework. "A hierarchical animation structure is very much like a directory structure where you have a root, then you have subdirectories. You have, for example, the base

Computer animation was used to create an assemblage of thirsty polar bears for a Coca-Cola commercial by Rhythm & Hues

of the neck as the root. Then, as a child or subdirectory of that root, you have the arm. So when the root moves, the arm moves with it. The arm might be split up again into subparts: the upper arm, the lower arm and the five fingers. In the case of the bears, if we rotated the forearm, the paws went with it."

Animation of the facial area was a bit more challenging. "We used some software that acts basically like a series of magnets," Ts'o explained. "Magnets are spheres of influence. You have the center of the magnet, and then you have the influence of that magnet which drops off. The further you go out spherically, the less influence that magnet has on the individual points of geometry. So points that are very close to the center of the magnet get almost all of that magnet's motion; others that are farther away get less."

When all the animation was approved, a higher-resolution bear surface was substituted for the wire-frame. "We used a program which took the motions of that wire-frame and applied them to the hero geometry," commented Ts'o. A troublesome aspect of the more realistic bear surface was the overlapping and crinkling of 'skin' at joint areas as the computer model moved. To alleviate such difficulties, software engineer Peter Farson wrote a program called 'Body' which allowed the joints of the computer model to bend smoothly. Subsequent refinements of the software were added by Mark Henne.

Public response to the bears was so strong that three additional spots were commissioned with themes relating to the winter Olympics.

By far the hardest obstacle to overcome was the rendering of fur on the creatures. Ultimately used was a hybrid approach combining two techniques. The first dealt with the bear's surface as seen straight on, and consisted of a texture map created by employing a digital paint program. "We scanned a bearskin rug as reference texture," revealed head technical director Georgia Cano, "then sampled the scanned-in rug as we were painting our bear." The second technique created the impression of protruding fur. Four hundred thousand tiny polygons – invisible in the straight-on position – were placed on the bear's skin, perpendicular to the surface. Tiny strands of fur mapped onto the polygons became visible as they turned perpendicular to the camera's line of sight. Since only twenty percent of the polygons were visible at any one time, the rest were left unrendered to increase computing efficiency.

Public response to the bears was so strong that three additional spots were commissioned with themes relating to the winter Olympics.

The completed digital animals were placed in a computer generated environment. "Keith Hunter and Nancy Klimley built CG mountains and applied texture maps on top for the snow," Weinberg commented. A noise function was then applied to yield a glittering effect. The shimmering northern lights were designed by Henry Anderson and executed by Juck Somsaman. They consisted of three auroras, each a texture map generated by paint software and applied to a constantly changing geometry. The illusion was created by smoothly interpolating between a series of half a dozen different geometries. During the interpolation, the texture maps themselves were moved along the surfaces.

Public and critical response to the spot was enthusiastic – so much so that three more bear commercials were ordered. Two featured Olympic themes to tie in with the 1994 Winter Olympics, during which the spots were extensively aired. The Olympian feats of the bears in these spots required slightly more anthropomorphic characters. "In the aurora borealis spot, the bears behaved like bears," Weinberg observed. "In the subsequent spots, we had more freedom because real bears don't ski jump or run luges or have ice skates on their paws – or drink Coke, for that matter."

'Skate' featured the bears ice skating around a tree. When one takes a spill, a Norman Rockwellesque Saint Nick – similar to the figure who has appeared for years in Yuletide Coca-Cola advertising – hands him a Coke. As a reference for the general motion of a skating bear, one of Rhythm & Hues' more athletic animators was videotaped skating around the company parking lot on a pair of in-line skates. Santa was a live actor who was filmed in front of a bluescreen by Image G, then digitally scanned and composited into the scene. "We made sure he was locked from the knees down so that we could easily work some CG snow around his feet," said Weinberg. In 'Jump,' a

bear glides down a ski jump and sails up into the sky. A series of texture maps was prepared, showing progressively extending ski tracks which were applied to the snow behind the bear. To simulate fur blowing in the wind, a procedural technique was developed to disrupt the fur in a random manner. The third spot, 'Luge,' featured wide-eyed bears hurtling down a bobsled run.

Each spot required additional snow effects. "We created little particle effects," said Weinberg, "like snow that comes off the skis when the bear jumps off the ski jump, the little bit of snow spray when the skating polar bear lands, and the snow that shoots up when the luge goes around turns." Rhythm & Hues turned to proprietary particle system software written five years earlier for shots they had produced for Flight of the *Intruder*. "The software we created then was named 'Bubbles' – even though we used it to produce smoke, not bubbles. I wound up using it to create the snow spray. We also used a more recently developed in-house particle software named 'Propane.'"

The artisans at Rhythm & Hues have been amply rewarded for their work on the polar bear spots, not only with audience recognition and critical accolades, but by their peers. The International Animated Film Society awarded 'Polar Bears' its Annie Award for outstanding achievement in an animated commercial – the first computer animated spot to receive the award. In addition, the Coca-Cola spots are still enjoying popularity, and the now-familiar polar bears are featured on everything from toys to T-shirts. "There's an entire line of goods with the bears on them," Weinberg said. "They've become a marketing phenomenon."

Stay tuned for further developments.

QUICK CUTS
SHADOW WORLD

article by Mark Cotta Vaz

From 1937 to 1954, listeners nationwide tuned in faithfully to *The Shadow*, a weekly melodrama whose mysterious namesake hero preyed upon the New York underworld in radio plays inspired by a long run of popular pulp novels. This summer, in a Universal Pictures release, this terminator of evil from America's pop culture past was revived in a stylish period piece directed by Russell Mulcahy. Commissioned by visual effects supervisor Alison Savitch to provide the film with an array of scene-setting matte shots were Matte World Digital and Illusion Arts.

Matte World – founded by Craig Barron and Michael Pangrazio – had until recently relied upon traditional model work and matte paintings for its varied contributions to films such as *Batman Returns* and *Dracula*. Last year, however, the company incorporated Silicon Graphics workstations into its artistic arsenal – and with digital capability came the change of name. "Matte World Digital is still an artist's company, driven by matte artists," Craig Barron noted. "We're concerned not with technology for its own sake, but with the look of the final image."

Matte World Digital had the opening shot of the film, in which an automobile drives past peasants harvesting opium poppies in the shadow of a Himalayan palace. "We did it as a classic latent image shot, the old-fashioned way," explained Michael Pangrazio who painted the palace and its background of snow-capped mountains, blue sky and clouds. "Camera operators Wade Childress, Rich McKay and I went down to Owens Valley to shoot the plate of workers in the poppy field and a car driving up to the palace. We put up glass to black out part of the frame, brought back the unexposed film and matched the painting to rock layers in the live-action."

Another key Matte World effect in the opening was a shot of mists parting to reveal the Temple of the Cobras. The shot incorporated a greenscreen element of actor Alec Baldwin with miniatures built by Greg Jein and Joel Friesch of a foreground hut, the mysterious temple and the mountains surrounding them. Chris Evans and Caroleen Green painted the models, transforming a construct of aluminum foil and plaster into a representation of snow-capped Himalayan peaks. To heighten the realism, the models were shot outdoors in sunlight, with blue sky and clouds in the background. "Although digital lighting has ray effects that mimic sunlight," Chris Evans noted, "the other values – atmospheric bounce light, reflected light – are difficult to duplicate in the computer."

For the obscuring mists, a practical smoke effect was incorporated during the filming of the foreground hut. Mulcahy wanted the mists to part, revealing glimpses of the sky and background, an effect which required the creation of transparent openings in the practical cloud effect. To create articulate-edge cloud mattes, a bluescreen was placed behind the hut model. "We created moving reveal mattes," stated digital artist Paul Rivera, "layered over and moving right to left with the clouds at the same speed."

The look of a stylized noir city was required once the action shifted to New York. Both Matte World Digital and Illusion Arts contributed scenes to establish the setting. "The New York of this film was a total recreation," explained Bill Taylor, who spearheaded the Illusion Arts effort with partner Syd

Dutton. “Basically, we took the most beautiful and interesting buildings from a number of different periods and jammed them together.” The first glimpse of this mythical metropolis is during a scene in which the Shadow rescues a man about to be dropped from the Manhattan Bridge by gangsters. Matte World shot a down-angle plate of the bridge with the widest Vistavision lens possible; however, the height limitation of the set precluded a view that would accommodate a composite element of water underneath. PhotoShop software was employed to lengthen the bridge deck and extend the towers skyward, which allowed for inclusion of the desired water plate.

The New York City produced by Illusion Arts included a period rendering of Times Square. The Y-shaped merging of Broadway and 7th Avenue called for creative improvisation since the Shadow backlot sets did not have either the configuration or scale to recreate the look of the actual location. “Syd Dutton had the idea to shoot two different angles of the backlot set and join the images together,” Taylor explained. “For the left-hand side of the image, we shot a plate with traffic and extras creating a busy scene; for the right-hand side, we moved down the street about half a block and shot the same traffic and extras doing a different action. We then joined the two images together, added paintings of skyscrapers in the distance, and rear-projected the live-action into the painting.”

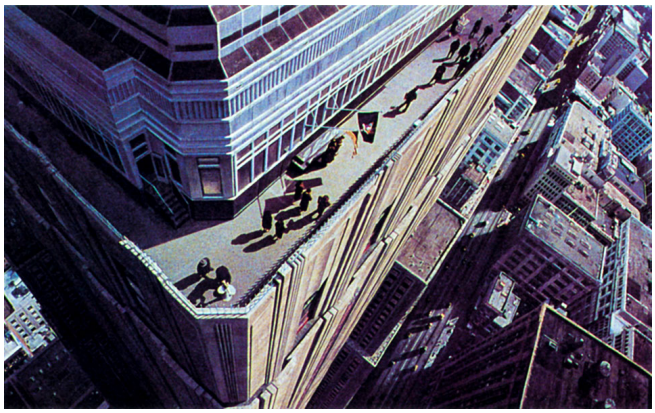
For a scene at the Cobalt Club, Illusion Arts utilized live-action and a Rob Stromberg matte painting to extend the skyline, combining the elements with latent image photography. “We put a black cardboard matte in front of the camera that locked off part of the frame,” Taylor explained, “and exposed the painting onto that area. That left us with a Vistavision negative that was high-quality and first generation. Then we made an interpositive and put that film on our optical printer and did a slight pan and zoom-in as the Shadow pulls up in his car.”

The two companies divided work on an Empire State Building sequence in which Shadow nemesis Shiwan Khan hypnotizes a sailor into taking a suicidal leap. Matte World combined a latent image of the jumper – an actor positioned on an observation deck set piece – with a miniature street model placed behind a glass painting of the skyscraper. The dramatic down-angle necessitated that some liberties be taken in the painting. “The real Empire State Building has broad ledges as it goes down,” explained Evans, who painted the image. “But the director wanted to see the street and emphasize the jeopardy of the situation; so we took artistic license, dispensing with the ledges and squeezing the face of the building down to a single vanishing point.” Illusion Arts added a final shot of the skyscraper and the jumper, combining foreground live-action elements with an eight-by-four-foot matte painting of the skyscraper and a computer generated figure animated by Fumi Mashimo.

The finale of the film is staged at the Monolith Hotel, an art-deco skyscraper that is concealed through the mental power of Shiwan Khan, on what seems to be a vacant lot – actually a location in downtown Los Angeles surrounded by Illusion Arts matte paintings of period New York.

Among the Matte World Digital shots for The Shadow were views of a Himalayan temple and a dizzying angle on the Empire State Building.

Studio backlot sets of New York were given an expansive look via digital and conventional matte paintings supplied by Illusion Arts.



Among the Matte World Digital shots for The Shadow were views of a Himalayan temple and a dizzying angle on the Empire State Building.

A highly detailed, six-foot-tall hotel miniature was constructed by Stetson Visual Services. “The building is revealed through shafts of sunlight coming through clouds,” said Taylor. “We used the model for both a beauty pass and to make a matte. Any dark holes or shadows that would have made holes in the matte – such as doors or windows – were plugged with cardboard strips painted the same green-turquoise as the miniature. Then we lit the model. In front we put a plastic wheel – four feet in diameter – that was rotated by motion control. As the wheel rotated, shadows of random patterns wrapped around the building, gradually revealing the model as the camera tilted up. That element was used as the wipe matte in the composite. Then we removed the cardboard pieces and photographed the building in another key light, which served as the beauty pass. We also did just a backlit pass – a silhouette of the building against all the passes tilting in motion control. Finally, David Williams composited the whole thing with a live-action plate, rotoscoped foreground action and background matte paintings.”

Studio backlot sets of New York were given an expansive look via digital and conventional matte paintings supplied by Illusion Arts.

It was appropriate, given *The Shadow*’s thirtiesera roots, that many of its visual effects evoked the classic techniques of old. While digital technology allowed for a freedom in compositing and image manipulation undreamed of by early effects artists, the hybrid techniques displayed in *The Shadow* prove that modern-day effects magic does not have to be only a digitally driven art form. “You’re still creating images,” Chris Evans observed, “whether by manipulating color on the end of a brush or pixels in a computer.”

COMMERCIAL SPOT LIGHT AND LIBERTY

article by Estelle Shay

To introduce a new women's line of Indiglo illuminated watches, Timex turned to one of the nation's foremost females for a unique testimonial. In a thirty-second commercial produced by the Fallon McElligott ad agency, the Statue of Liberty briefly comes to life when a massive blackout resulting from an electrical storm over New York extinguishes her torch. Her eyes opening wide, Lady Liberty lowers her torch-bearing arm, revealing an Indigo worn on her wrist. Pulling her left arm away from her side, she uses her index finger to push a button on the watch, activating its glow feature. A final shot reveals the statue back in its original position, with the light from the Timex illuminating the harbor.

Oscar-winning visual effects supervisor John Bruno was recruited to direct the spot, with Clive Milton of Digital Domain producing. "The agency sent me some simple, stylized storyboards and said they would be interested in having me direct if I could give them an approach," Bruno recounted. "There were budgetary considerations involved, so I storyboarded a version that took the perspective of shooting the entire spot from the height of the statue. I suggested that several shots could be achieved using a detailed model that we already had on hand. For other shots, I proposed building a body suit – an accurately sculpted replica that an actress could wear so that her arms would do the movements necessary for the story line. I did a video test of the existing model and sent it to the agency along with the storyboards; and they loved it. They loved the whole concept."

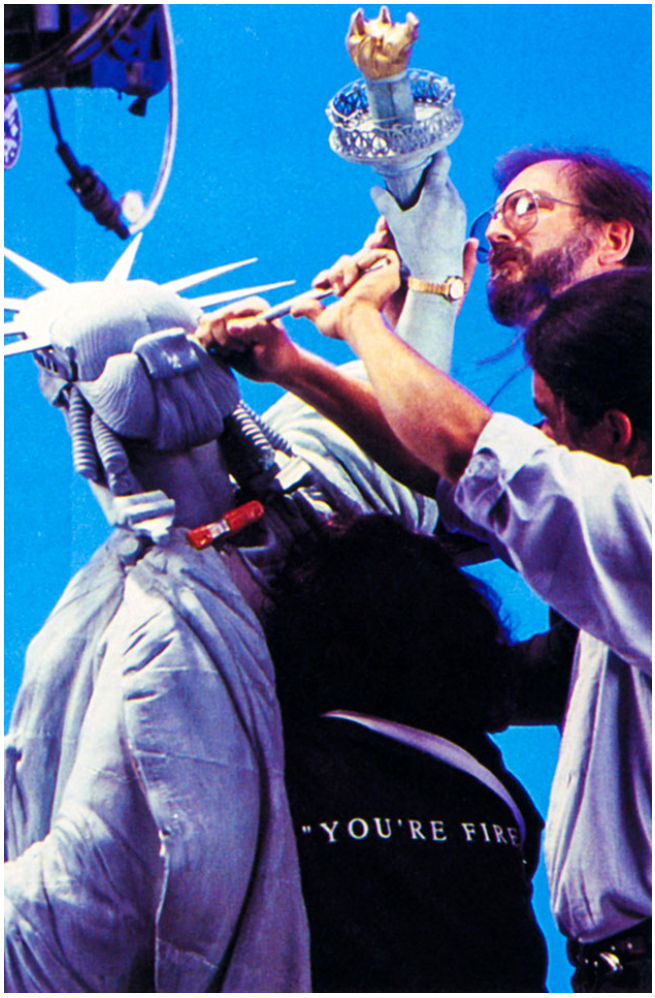
Lady Liberty uses her Indiglo watch to illuminate Manhattan in a Timex commercial produced at Digital Domain.

Background plates of the city, photographed from a helicopter, took just three days to complete. Although opening views of the Manhattan skyline were filmed just after sunset, shots of the Empire State Building and other city skyscrapers illuminated against a night sky required night shooting. "We ended up shooting at eight frames a second to get enough exposure," Bruno elaborated. "We were originally thinking of filming at dawn to get some sort of backlight on the city, but then we learned that lights in the Empire State Building are turned off at midnight. So we risked a couple of runs at ten or eleven at night in some very stormy weather. The idea was that we would matte out the lights later to create the blackout effect." Another shot involving a helicopter move up and over the shoulder of the statue required a perspective shift for a plate with the Verrazano Marrows Bridge in the background. "We put the helicopter in a slight dive – going down to a hundred feet – and then pulled back hard, climbing quickly to four hundred feet. We shot that day-for-night and timed it to match our other footage in post."

Collaborating with Digital Domain on the project, Bruno recruited Pat McClung as model supervisor. “The real Statue of Liberty never appears in the commercial,” Bruno stated. “We did film it, but only as a reference so that we could duplicate the lighting on it at night.” An early establishing shot and a closing shot of the full statue were achieved using the existing two-and-a-half-foot-tall replica which McClung contributed. For closeups and shots of the statue coming to life, the model unit constructed a combination suit and rod puppet. “My initial idea was to use a human inside a suit from the waist up,” McClung explained. “But after John redrew the storyboards, we realized we could dispense with creating a complete suit by going with a human-size rod puppet, with an actress animating only the left arm.” Once sculpted by Stacy Wexler, the puppet’s head was cast in a stiff but flexible foam rubber. A metal rod was inserted at the back of it and the neck was hollowed out, enabling the head to turn. The statue’s flowing cloak, sculpted by Wexler and Tully Summers, was cast in a soft polyfoam laid over the top of a fiberglass core anchored on a platform. For the arms, plaster castings were made of the actress whose real arms would be inside the fake ones. “Tully sculpted on top of the castings in clay, thinning down the wrist a bit for the sake of aesthetics and exaggerating the plating and rivet detail for greater visibility.”

Director John Bruno instructs his crew during filming of a replica Statue of Liberty. (Photo: Tony Friedkin)

Supervising the suit photography at Digital Domain was Doug Smith. Because the puppet was painted green to represent tarnished metal, bluescreen was chosen over greenscreen for the shoot. “Since our shots were framed primarily from the front,” stated McClung, “we were able to cut a big hole in the back of the cloak so that our actress – actually my sister, Denise Hewitt – could sit behind it, slide her arm through the fiberglass form and out the rubber cloak into the fake arm.” To guide Hewitt in her movements, a video monitor which afforded her an unobstructed view was set up on stage.



Denise Hewitt operates the figure’s arm by hand, while Craig Caton and Patrick Shearn use rods to articulate the extremities. (Photo: Tony Friedkin)

To really sell a shot in which the statue’s left arm pulls away from the cloak, Bruno devised an enhancing effect. “On the real Statue of Liberty,” McClung said, “the arm is holding a tablet nestled in the cloak – and it’s all kind of sculpted as one. If the arm were to move, it would literally have to rip away from the side. So John shot it from a low angle looking up, and did this gag where you see powder and little pieces of metal falling away as the arm wrenches free.” For a closeup of the watch on the statue’s wrist, an actual Timex Indiglo was used.

With stage photography completed in just two days, visual effects supervisor Fred Raimondi began compositing and digitally enhancing the shots. “Since I had something like three weeks to do nine shots, there was ample time to tweak each one perfectly,” Raimondi remarked. Particularly challenging was the blackout of the Manhattan skyline – an illusion that ultimately required a number of attempts to perfect. “First I tried having all the lights go off nine frames apart from left to right. Then I tried starting on the outsides and moving to the middle. Finally, I ended up using a more random pattern.” Raimondi also used color grading to enhance the effect. “I didn’t want it to look like someone just popped a black matte over the city, so I left some detail in the buildings. If you look at them closely, the lights are still there. They’re just brought down dark enough so that it feels like they’re off.” For storm effects, Raimondi composited stock storm clouds and lightning into the background plates. Other detailing – such as glows inside the clouds, bridge and boat lights, reflections in the water, color changes, even some drifts to compensate for the fact that the helicopter plates were too steady – were all added digitally.

A closeup of the statue’s eyes moving was achieved through a combination of model work and digital effects. “Initially we talked about doing it CG,” noted Raimondi, “but we thought it would be more interesting to actually have a real eye; so John Ferrari took a cueball, lathed it out to form the eye, and stuck it on a rod. It was then shot on a motion control rig with the eye looking up and down. I rotoed out the original eyes on the statue and stuck the new one in there.”

The closing shot, utilizing the nonarticulated miniature replica, required one final digital manipulation. “We had what I considered a really nice shot,” noted Bruno, “with the miniature statue just standing there in its traditional pose. But, for the sake of accuracy, the client wanted to show the statue actually holding down the button that illuminates the watch – since, in reality, the watch will not glow unless the button is depressed. So we had to go in digitally and add the other arm – just paint it and stick it in there.”

Pleased with the results, Bruno is convinced that going with a combination of rod puppet and digital techniques was the best possible approach. “Right from the start, I rejected the idea of using computer graphics for the statue – even though it was the obvious choice. Given our time and budget constraints, the process we used gave us many more options. We were able to build everything in three weeks and could do any number of variations instantly during the shoot – from camera moves to lighting changes. With CG, it would have been much more limiting.”

FROM ZERO TO HERO

image

article by
Jody Duncan

Only six short years ago, *Who Framed Roger Rabbit* wowed the effects industry and lay people alike with its unparalleled blending of live-action and two-dimensional animation. Setting a new standard for an effects technique that had, in previous attempts, never been altogether convincing, three hundred artisans painstakingly hand-animated a host of new and familiar cartoon characters to populate a comedic film noir world. That benchmark production has now been technologically bested by *The Mask*, a summer offering from New Line Cinema in which, for the first time, three-dimensional animation and live-action are blended as smoothly as fine spirits. Through digital techniques, Industrial Light & Magic endowed the already malleable actor Jim Carrey with the ability to change shape, freeze in midair and generally defy all laws of physics. These classic cartoon gags – styled after the work of animation great Tex Avery – were supported with makeups created by Greg Cannom and his Cannom Creations crew. Dream Quest Images also stepped in near the end of production to provide additional effects support.

Based loosely on the comic books of the same name, *The Mask* chronicles the character transformation that takes place when mild-mannered bank clerk Stanley Ipkiss (Carrey) – the archetypal nice guy who finishes last – finds a centuries-old Viking artifact with magical properties. Once donned, the ancient mask releases the hidden desires and personality traits of its wearer, and Stanley becomes a tornado of cartoon energy – as cocky as Bugs Bunny, as frenetic as Daffy Duck.

In The Mask, the summer blockbuster from New Line Cinema and director Charles Russell, makeup effects by Cannom Creations and digital scene-stealing from Industrial Light & Magic and Dream Quest Images merged with the comedic talents of actor Jim Carrey to create an outlandish cartoon-style hero. Through an unprecedented blending of live-action and computer animation, the story depicts the transformation of timid bank clerk Stanley Ipkiss into a debonair, green-faced lothario courtesy of a centuries-old Viking mask with magical properties. Empowered by the mask, which brings out the hidden personality traits and secret desires of its wearer, Stanley changes his life – and even gets the girl.

The light-hearted, fanciful tale was something of a departure for director Charles Russell, a veteran of *The Blob* remake and nightmare on *Elm Street* 3. The project also marked a new direction for New Line, an independent production company that had the courage and foresight to commit forty percent of its $20 million film budget to eye-popping visual effects. The gamble paid off. Splendid execution of the premise and the glitter of Carrey's rising star combined to make *The Mask* one of the biggest hits of the summer.

ILM was first approached with an early version of the script in 1991. "That script was based on the comic book," recalled visual effects supervisor Scott Squires. "It was more horrific, with a lot of people getting killed. Later, Chuck Russell brought in this newer version; and we read it and saw the possibilities there. He had made it more of a cartoony, romantic comedy – and that made it really interesting to us."

It was particularly interesting to animation director Steve Williams, a traditionally trained animator with a lifelong appreciation of cartoons in general and the Tex Avery animation style in particular. "This was a performance animation job," noted Williams, "as opposed to a visual effects job. The project nearly caused a mutiny here at ILM because all the animators wanted to work on it. After *Jurassic Park*, it seemed that all the envelopes had been pushed and there was nothing left to do. But then this job came along and it saved our sanity. Up to now, we've been trying to duplicate the natural laws of physics – but it's a lot more fun to do funny cartoon gags than it is to make the skin on the ass of a reptile jiggle."

A colleague of Russell's who had worked with the director on his Nightmare on *Elm Street* entry, Greg Cannom joined the project even before ILM became involved. In addition to providing the makeups for Carrey as *The Mask* and Dorian Tyrel – the villain who steals the mask and reveals his monstrous character upon donning it – Cannom was initially commissioned to create a variety of mechanical effects to simulate Carrey's cartoon transformations. "We were going to produce a variety of puppets," Cannom recalled. "Then *Jurassic Park* came out and that changed everything. The director and producers realized that they could do all of that stuff with computers – and I totally agreed with that decision. You can build nice puppets, but they still look mechanical compared to the fluid effects you can do with computers. So the mechanical effects went out the window; and I ended up just doing the makeups."

First on the agenda was Carrey's Mask makeup, which would be prominently featured in the movie. Early conferences with Russell had revealed the director's concern about makeup interfering with Carrey's naturally mobile face. "I agreed that the makeup should work around Jim's face so that he would still have a lot of flexibility," Cannom noted. After doing a lifecast of Carrey in Florida – where the actor was completing Ace Ventura: Pet Detective – Cannom returned to his studio to begin designing the makeup. Instructed by Russell to ignore the look of *The Mask* in the comic book, Cannom came up with an original design intended to transform Carrey into a bigger-than-life character. "One thing that makes a face look cartoony is huge eyes," Cannom explained. "So we tried putting lime green contact lenses on Jim. They were beautiful lenses, but they made him look demonic. In the end, we had to rely on exaggerated bone structure and large teeth to make his head look big and cartoony and out of proportion. Jim has an enormous mouth, so we were able to use really big teeth."

Mechanical designer Larry Odien built an initial set of teeth that were large and square – like piano keys. “Those were too cartoony looking,” Cannom commented, “so Larry went back and resculpted them. They were still square on the bottom, but more rounded at the gum-line on top. They were huge dentures that slid over Jim’s own teeth. We filled out the inside, where his real teeth and gums would be, with a soft flexible dental material so that the dentures would have some suction. Larry went in about ten times, drilling and sanding and cutting down certain areas so there would be no painful pressure on Jim’s gums. It took a lot of custom fitting to get them to where they were really comfortable.”

The initial concept also included exaggerated cheekbones and tiny ears protruding from the back of the mask. “The tiny ears made the head look much bigger and created a real separation between the front of the face and the back of the head. But when Jim saw it, he said: ‘No, no, no. I don’t want the ears. It needs to be more like the comic book character.’ So we took them off.” With the ears gone, Cannom decided that a large ridge running up the side of the face to delineate the edge of the mask was now inappropriate. “Once we got rid of the ears, it looked wrong to have a big space there. The other thing was that Chuck wanted him to look very handsome and dapper – which meant going with bigger cheekbones. But we couldn’t make these big cheekbones and then just stop them at the back of the head – it looked ridiculous. So I finally gave up and took the cheekbones all the way back into the ear area, blending them into Jim’s natural bone structure. It was a cleaner, more streamlined look that worked much better than my original idea.”

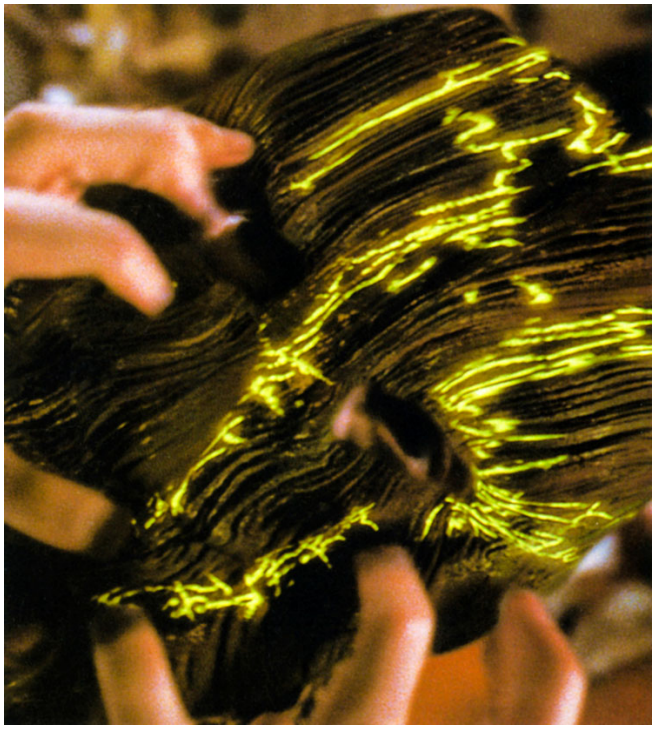
The final design was sculpted in rough form by Cannom, then finished and detailed by Glen Hanz. From the sculpture, epoxy molds – which hold up much better than standard plaster molds – were made to produce five overlapping foam latex appliances. “There was a piece that covered the back of the neck and top of the head; two side pieces with cheekbones that blended down into the chin, around the mouth and onto the nose; a chin piece that had the whole jaw in it that blended into the ear area and onto the side pieces of the cheeks; and a forehead piece that blended onto the cheekbone and the head. We ended up running about fifty sets of the appliances.”

Pax paint was used to render the cast pieces the bright lime-green color specified by the director. “The nice thing about Pax paint is that the colors come off very alive and more real looking on film than rubber mask greasepaint. But it’s a very shiny material; so what I’ve always done is paint the foam pieces in Pax paint and then go over them with a rubber mask greasepaint. You don’t want to use Pax paint around people’s eyes; so we had to find a makeup that matched the lime green color.” The desired makeup shade was custom-blended by Joe Blasco Cosmetics and produced in quantity specifically for the show.

Application of the makeup was a two-and-a-half-hour affair. “Cheryl Ptak – who was Jim’s makeup artist on In Living Color and is now his personal makeup artist – applied the makeup on the set after I showed her how to do it a couple of times,” Cannom related. “She was very good with appliances. We glued down Jim’s ears so they wouldn’t stick out from beneath the foam latex; then we put on the huge head piece and the back of the neck. It was crucial to get that first piece down correctly, otherwise the whole makeup would be off. After that was glued down, we’d put the chin piece on, then the cheek pieces, and finally the forehead piece.” Despite the time-consuming application process, Carrey maintained good spirits throughout. “Jim would listen to loud rock

music throughout the application – but whatever it takes to help actors get through that process is fine with me. I really feel for actors who have to go through this. It's fine for the makeup artists – we're working and concentrating – but for the actors, it's really boring just sitting there day after day."

Cannom also created stunt makeups to be worn by Carrey doubles in long shots. "We sculpted those makeups to look just like Jim Carrey as *The Mask*. They were done as one- or two-piece makeups because they were only seen in long shots in which detail and movement didn't matter too much."

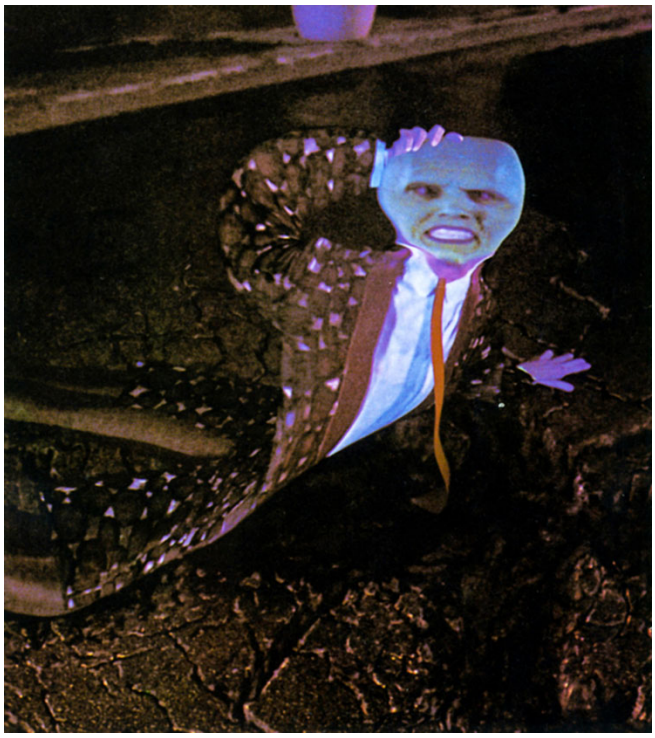


The supernatural quality of the mask is evident when Stanley puts it up to his face and it immediately begins to glow and pulsate and cling to his features. To achieve the 'mask-wrap' effect ILM created a computer model of the live-action mask, then transitioned to a pulsating variation of it.

The other character in the story to require a major makeup was Dorian Tyrel (Peter Greene), the renegade gangster who steals the mask with the intent to use its power for criminal pursuits. Upon donning the artifact Dorian transforms into a horrific looking monster. "This was a fun makeup to do because we didn't have to copy the actor at all – we got to go totally insane with it," Cannom commented. "Because Peter had such great bone structure and such big eyes, we were able to go farther with the makeup than we could have on a normal type of face. We were able to make this huge head and face, and he could pull it off."

Hanz and Cannom sculpted their design over a lifecast of Greene. The end result featured a bulked-up neck and a large head – complete with an Elvis-like pompadour – gnarly false teeth and red eyes. "We put huge red and yellow contact lenses on him to make him look more evil." Like the Mask makeup, the Dorian monster makeup consisted of several latex appliances. "There was a wraparound neck, a full back-of-the-head, and a number of pieces on his face. We left the top of his head open to keep Peter more comfortable and cool. We were able to do that because he was going to be wearing a wig which covered the top anyway." To emphasize the 'darker' nature of Dorian's character, Cannom colored the appliances a deeper green than Carrey's Mask makeup.

Built but never filmed was a computer-linked, servo-driven mechanical head for a scene in which Dorian in the mask reveals a long, reptilian tongue. "It was for a scene at the end of the movie where Dorian extends this long tongue which comes out and licks his eyebrows, moves around in the air, and then whips back into his head. I didn't understand why Chuck Russell wanted a mechanical head, because it was something that obviously could be achieved with the computer; but he was adamant about it. So we built it; and just as we finished it, they called up and said, 'We're not going to shoot it.'" The tongue



Transformed into a frenetic cartoon character, Stanley jumps out an upper-story window, landing flat – literally – on the pavement below. Digital artists texture-mapped photography of Jim Carrey, front and back, onto a pancake-thin computer figure.

Live-action shots of Carrey as The Mask were achieved with an elaborate prosthetic makeup designed by Greg Cannom, while classic cartoon-style embellishments, such

action was ultimately provided through digital means.

The Cannom makeups were scanned by ILM so they could be used as a starting point in developing the computer generated imagery that would comprise the majority of *The Mask*'s visual effects workload. One of the most extensive character animation jobs ever to be taken on at the facility, *The Mask* – which entailed nearly ninety shots of computer animation – would require the varied expertise of visual effects producer Clint Goldman, animation directors Steve Williams and Tom Bertino, visual effects supervisor Scott Squires and visual effects consultant Ken Ralston. Specific effects were divided among computer graphics supervisors Ellen Poon, Jim Mitchell and Sandra Ford Karpman. Providing art direction for the sequences were Benton Jew and Doug Chiang.

The Mask espoused the wacky cartoon style of its comic book source material, which relied heavily on Carrey's rubbery features and such as popping eyeballs and waggling tongues, required computer graphics enhancement.

Among Squires' duties was supervision of the background plate photography which continued throughout the shooting schedule. As always in effects-intensive productions, the lighting and composition of those plates were critical to the success of the computer graphics elements – although advances in digital technologies have lessened the degree of precision that was crucial even as recently as *Terminator* 2. "An interesting thing on *The Mask*," said Squires, "was that we shot all the live-action with no motion control. We allowed the camera to have the freedom that the director wanted. The CGI work was made to accommodate the action at every twist and turn." Mechanical effects that would suggest interaction of the digital animation with the backgrounds were accomplished by special effects supervisor Thomas L. Bellissimo.

Having made an unauthorized withdrawal The Mask bursts out of a bank in a swirling vortex – a signature effect of the film employed whenever the character was executing a transformation or moving quickly from place to place. The digital vortex consisted of a spinning core – texture-mapped with photography of Carrey in appropriate costumes – encircled by animated concentric rings.

Early preparatory work included producing rough mockups of the animation. “We photographed Jim Carrey with a still camera and did a lot of work on the Macintosh,” Squires said, “just to get an idea of how the animation effects would work. Chuck Russell knew that the effects were really going to have to hold up – *The Mask* was his main character, and he had an awful lot of screen time. So we spent a lot of time developing these gags in rough form, nailing them down.”

Enjoying a night on the town, The Mask visits the Coco Bongo club. Responding as any self-respecting cartoon character would to the sultry singing of Tina Carlyle (Cameron Diaz), The Mask’s eyes pop and his tongue rolls out on the table. The aesthetics of such classic cartoon gags required careful consideration to avoid effects that would translate as too grotesque in the 3-D world.

The Mask makes his first appearance after Stanley returns home with the unusual artifact he has found floating in the harbor. Contemplating his loser life from a bridge where his dilapidated loaner car has broken down, Stanley spots what he believes to be a person drowning in the water below. Jumping in to rescue him, Stanley discovers that the victim’ is, in reality, a strange wooden mask caught on ocean debris. Stanley returns to his shabby apartment with the mask, soon forgotten as he settles in with his dog Milo to enjoy his lonely pastime-watching tapes of classic Tex Avery cartoons.

A more involved introduction of the mask was shot, but cut from the final film. Photographed in black-and-white, the original opening showed an ancient Viking ship’s crew disposing of a crate containing the magical mask. Subtitles explained the troublesome nature of the artifact and the reasons for its disposition to the ocean floor. A shot of a land mass close by then dissolved to the exact same spot-now the polluted Edge City in which Stanley Ipkiss lives - in modern times.

Digital matte paintings were created at ILM for both views. “Eric Chauvin did a ‘before’ and ‘after’ matte painting of that same view,” explained Sandy Karpman, “a view from the ocean in the Viking sequence, and a view in modern times with the city in the background. The ‘before’ version was cut, of course, when the whole Viking sequence was eliminated. Now the movie begins with the matte painting of Edge City that you see from the water. Everything in that shot is painting except for the breakers and the ocean water.” To bring the shot to life, the painting featured several moving elements. “Our matte department is now building three-dimensional objects and animating them. They’re not equipped to do the number crunching we do for the 3-D stuff on a large scale; but they’re fully equipped to do small screen-space rendering, for this opening shot, they put in background traffic and sea gulls.”

After the abbreviated opening, and an introduction of Stanley at the bank, the film moves to Stanley’s discovery of the mask and his return home where an encounter with his hostile landlady further demonstrates his timid nature. Drawn to the mask by Milo, and noticing an eerie light emanating from it, Stanley picks up the artifact and casually puts it up to his face. Immediately, the mask seems to come to life, pulsating and wrapping itself around Stanley’s head with extending tentacles. “The mask-wrap animation had to look organic,” stated Ellen Poon, computer graphics

supervisor for the effect. “The mask had to convey a feeling of being a living, breathing organism. We started with the wooden mask they were using in the live-action and introduced CG effects to make the mask pulsate and light up – you see light effects coming through the cracks as if the living mask is breaking through from within the hard wooden mask. Habib Zaragarpour was technical director for the sequence, and he worked very closely with me in developing the look of the effect.”

Poon and her modeling team of Kyle Odermatt, Stewart Lew and Shawna Olwen first built a computer model of the ‘hard mask’ – their term for the inanimate wooden mask. Then, the model of the ‘soft mask’ – the organic, pulsating version – was built, complete with moving tentacles. “The effect of the mask wrapping around Jim Carrey’s head was achieved using a combination of ILM proprietary software and Softimage,” Poon explained. “Our software allowed us to sculpt key positions of the mask very quickly. These were then imported into Softimage to give us the in-betweens. Of course, not all of the in-betweens came out right. We had to go back to fix some of them and make them more interesting.”

One of the trickiest aspects of the mask-wrap was tracking it to Carrey’s frenetic movements around the set. “That took a long time to get right,” Poon admitted. “Our match-movers, Pete Daulton and Jim Hagedorn, had to painstakingly hand-track the mask in 3-D space to match Carrey’s performance. We relied heavily on measurements from the set, as well as just eyeballing it to see what looked right. We also had to do a major painting job because Jim’s hair was flying everywhere. You are not supposed to see any hair when the mask wraps around him, so our digital artist Jack Mongovan painted it out and digitally recreated the backgrounds in the places where the hair was removed. This was done frame by frame for the entire sequence.”

As the mask fixes itself into place, Stanley transforms into *The Mask* – but not before spinning around the room like a runaway tornado. A signature effect which served to signal Stanley’s transformations, the whirling vortex was showcased a number of times throughout the film. It was also used in sequences in which the frenetic Mask zips from one place to another in classic cartoon style. “That effect went through a few iterations,” noted animation supervisor Jim Mitchell. “Initially we were going for a Tasmanian Devil look, where it was basically opaque and every once in a while you would see an arm or the head.” Dissatisfied with how that look translated into three dimensions, the computer graphics team took a low-tech route to develop more dynamic reference material. “Doug Chiang and Benton Jew took a G.I. Joe doll, put it on the end of a drill, dressed it in a yellow zoot suit, and just started spinning it and filming it on videotape – and that became the reference. Amazingly, it looked pretty good. We figured out that what was missing was that we still needed to see a bit of Jim Carrey at the center of the tornado. It was as if his clothing was wrapping around him and this process of streaking and blurring gave it a funnel look; but you always had to have the sense that you were catching his eyes and his expression from time to time. You had to know there was a body in there.”

Having cracked the code for the vortex effect, the animation team constructed a three-dimensional computer generated ‘core’ which resembled a simplified version of Carrey. To get the texture and coloring of his clothing onto the spinning 3-D core, Carrey was photographed in front of a bluescreen wearing each of his costumes. “We shot him on a rotating table,” said Squires. “Then we could scan those images and choose which areas we wanted to use. As the tornado is going on, you see coloring and texture transformation, going from what he was wearing to what he is wearing

when he comes out of the vortex. So he might start in his pajamas and end up in the zoot suit." The vortex effect was also made up of concentric rings animated by the digital team to undulate and circle the spinning core. "We built a number of rings around the core – kind of like different sizes of tires – and those were animated and rendered individually, with different opacities and reflectivities."

On the set, Carrey would start the spinning move, then walk out of frame. "We would hook up our CG vortex to him at that point," Squires explained. "Then, when he is coming out of the vortex, Jim would come in and do a twirl and we would transition out of our vortex into that live-action. All of this was without motion control; we had to track everything so that Jim and Chuck would have as much freedom on the set as possible."

To further sell the vortex effect, Tom Bellissimo set up interactive gags on the set. Pieces of furniture were rigged to fall over, and wind machines provided a general frenzy supposedly caused by the tornado. "There was a sequence at the bank where the vortex explodes out the door," Mitchell commented. "That was all rigged with practical explosions. In the bedroom vortex scene, there were fans on, and lamps knocked over and a general sense of mayhem." In one case, computer graphics were used to support the illusion of swirling energy surrounding the tornado. "There is a sequence in the park where the tornado goes by. On the set, they moved a bush a little bit as if the tornado was passing; but something was missing, so we added CG leaves blowing around."

Transformed into *The Mask*, Stanley decides to go out for a night on the town. Leaving his apartment, he pulls a screaming cartoon alarm clock from his pocket and attempts to silence the bouncing timepiece by hitting it with an oversize mallet. "The clock sequence was shot blind," Steve Williams noted, "so Jim Carrey had nothing to follow with his eyes. He just did his eye reactions and movements based on how he thought the clock would be moving. The clock was supposed to be very cartoonish in that it bounces and stretches and gets squashed. Chuck was willing to let us screw around with the live-action cut in order to make it work. I could say, 'Let's lose ten frames here, add ten frames to the tail of the shot here' – and he was totally open to that. It was great, especially for a scene like this where the action had to flow from shot to shot, and it all had to be seamless."

Awakened by the melee in the hall, the mean-spirited landlady emerges from her apartment with a shotgun. Rather than collapsing under her verbal abuse, however, this time Stanley – in his dapper Mask guise – confounds the poor woman with classic cartoon character behavior: he emits a blood-curdling scream, his eyes pop, his tongue rolls out, he bounces down the hall, then jumps through the upper-story window, landing flat on the pavement below. "This is the first time we see him using his magical powers," Poon commented, "so it took a while for us to figure out what style of animation we should be going for. At first we had him zigzagging off the walls and ceiling. But the director wanted him to look more like a pogo stick, so we changed the animation to suggest that kind of movement." A simple computer model which resembled a body with arms locked at its sides was built, with photographic imagery of Carrey texture-mapped onto it, front and back. "You don't see his face when he is pogoing down the hall, so we didn't have to worry about that much detail. We just texture-mapped photography of his body onto it, without actually building realistic arms and legs. That model was then given to Wes Takahashi to animate."

For the following shot of Stanley's fall out the window directly toward camera, a stuntman was shot with a cable attached to him. "He was dropped towards camera from the top of a building," Poon said. "Obviously, they had to slow him down as he got close to the camera; but for the shot, we wanted him to accelerate in speed as he fell, so my job was to do some skip-printing so that it would look as if he was coming right towards the camera, full-speed. I then created some artificial motion blur. We actually go into his mouth at the end of the fall. We see his teeth, his uvula – all of which was created in CG."

When Stanley lands, he flattens like a pancake, then peels himself off the pavement and shakes out to normal size. Carrey was photographed front and back, with that two-dimensional imagery then

Joining Tina on stage, The Mask performs an exuberant dance number which concludes with his dodging a barrage of bullets by stretching his body from side to side. Footage of Jim Carrey was digitally distorted for the shot while the 'crazy-legs' dance – in which The Mask performs all manner of contortions – was achieved by digitally erasing the lower half of the actor's body frame by frame, then replacing it with computer animated legs.

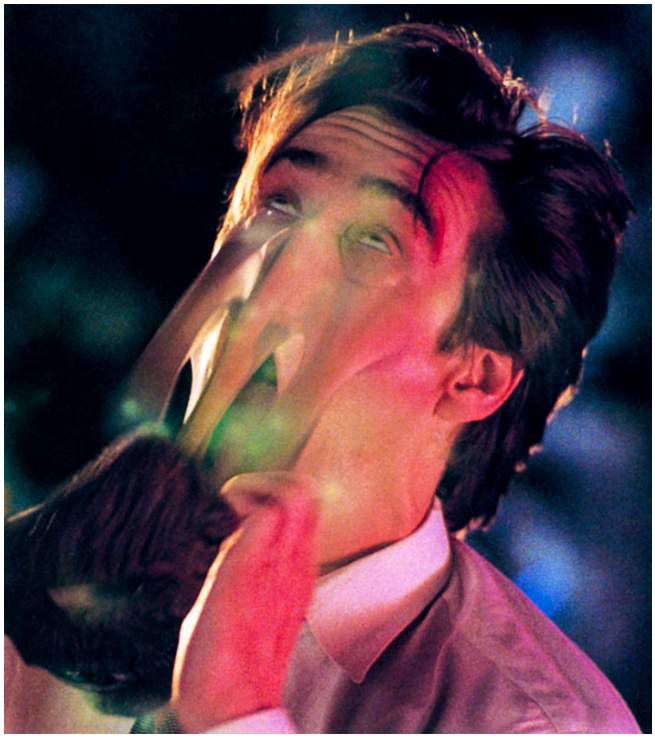
Overcome with desire for Tina, The Mask transforms into a whistling, lecherous, Tex Avery-style cartoon wolf To

scanned into the computer to provide a texture map for the 'flatman' model. "We filmed him in front of a bluescreen, in a neutral position, saying his line, 'Hey, Mom, I'm road kill,'" Poon explained. "After that was scanned into our system, we built a flatman model. The flatman was a three-dimensional model – albeit a thin one – so that Kyle Balda could animate it. That was all done inside Softimage by distorting the skeleton and the geometry." Animation on the shot took about ten weeks to perfect. "The peeling off the pavement was straightforward, but the shaking-out part – where he balloons out a little bit – took more experimentation. It had to be cartoony and it had to be funny."

create the effect, ILM animators started with a plate of Jim Carrey miming the action. [illegible] from the original footage.

Cornered by the police, The Mask takes the command to 'freeze' literally, halting in midair as icicles and frost form on his body. A plate of Jim Carrey was shot in a frozen position, then enhanced with computer generated icicles and a pa in ted frost pattern.

Escaping the law, Stanley steps into an alley to remove the mask. The effect required that Carrey's grimacing expressions be incorporated into the CG mask as it was removed.



Fleshy tentacles cling to Stanley's face as he struggles to remove the artifact.

Restored to normal shape, Stanley continues his cartoon hijinks. When an irate motorist honks at Stanley, who is standing in the middle of the street, the impudent Mask pulls out a bicycle horn to honk back. "When he squeezes it," said Poon, "the horn becomes a gigantic human mouth that says 'Aooga!'" Carrey held a real bicycle horn in the live-action scene, and Kyle Odermatt modeled a matching CG version which Poon animated. "Kyle built it to the dimensions of the original horn, and then I positioned it so that it looked as if it was in Jim's hand. It was then animated to grow from the small horn to the large mouth-shaped horn. Cast shadows of the horn were added onto Jim Carrey and the car to tie it into the background better."

Running into a gang of young hoods, *The Mask* first distracts them by making balloon animals, then threatens them by magically producing real tommy guns from the balloon sculptures. Les Major animated the sequence, while Christophe Hery provided technical direction. "What was difficult was all the action with the hands," Mitchell observed. "Carrey had to pantomime tying knots because the balloon in that shot was all CG. That CG balloon had to transition into the CG tommy gun, which had to match the real tommy gun that he held in the following shot. It was a real trick for the artist to look at this plate and figure out: 'Where is his hand? Is he holding onto this balloon correctly?' He had to look as if he was really gripping this CG tommy gun in that shot."

Waking up the next morning as himself, Stanley is convinced that he dreamed the entire nocturnal episode. It is only when confronted by police lieutenant Kellaway (Peter Riegert) that Stanley realizes his escapades as *The Mask* truly occurred. Somewhat spooked by the powers bestowed upon him by the mask, Stanley returns to work firmly resolved to leave it alone. But after learning that Tina Carlyle (Cameron Diaz), the beautiful blonde he has met at the bank, is singing that night at the Coco

The mask falls into the hands of evil gangster Dorian Tyrel (Peter Greene), who becomes a horrific monster upon donning it. To enhance the transformation, Dream Quest Images digitally manipulated cloud tank footage and composited it into the scene.

Dream Quest also realized a computer generated tongue which was animated and tracked to Greene's performance. The actor's real tongue – which was extended and moving

Bongo nightclub, Stanley determines to visit the club as his dazzling alter ego.

throughout – had to be painted out frame by frame for the entire shot.

At the bathroom sink in his apartment, Stanley – as *The Mask* – prepares for his night on the town. "In the bathroom scene," noted sequence supervisor Sandy Karpman, "he brushes his teeth, blows dry his green head, sharpens his razor blade, applies shaving cream, shaves, wipes his face with Milo, sprays on cologne, and then delivers the line, 'Somebody stop me,' all in one manic, seamless cut. We shot Jim doing each of the eight events. Chuck Russell told us what order he wanted the elements to go in, but gave us total freedom to determine cut lengths and how to transition from one element to the next. Dennis Turner worked very closely with Steve Williams and Scott Squires to determine the best transitions." A variety of techniques, including hand painting and morphing, were used to create smooth transitions. "We also used a stretch program to control exactly when we needed to speed up the Jim Carrey elements, without that skip-frame, jumpy look."

Joining the climactic battle against Dorian – rendered invincible by the mask – is Milo, Stanley's ever-faithful dog. After persuading Dorian to remove the empowering artifact for a moment, Tina kicks the mask into the air, where Milo catches it on the fly and puts it on, becoming the veritable 'superdog' of his dreams. For the ensuing sequence – in which Milo gets the upper hand on Dorian's goons – ILM replaced the dog's real head with a computer generated version intended to suggest a beefed-up, cartoony Jack Russell terrier.

At the end of the sequence, *The Mask* makes a classic cartoon exit. He takes off his feather-dressed hat with his right hand, then departs in a flash, leaving the hat and hand remaining in frame, his arm elongated in the process. The hat and hand then zip out of frame, leaving the feather to follow after a beat. "Kyle Balda modeled and animated an arm, a hat and a feather," explained Karpman. "In the composite, Dennis Turner transitioned to the computer elements right after Jim Carrey takes the hat off. Dennis did a two-dimensional match-move of Carrey's real hand so that it would remain attached to the CG arm and continue holding the CG hat."

Stanley regains the mask and puts it on. Unharmed by a hail of bullets fired into him, The Mask pauses to down a glass of orange juice. In another classic cartoon gag, the juice pours from the bullet holes in his body.

On his way to the club, *The Mask* stops at the bank to 'get some green.' Rather than make a standard ATM withdrawal, however, the unscrupulous character robs the bank in a series of spinning moves, leaving floating bills in his wake. Unbeknownst to *The Mask*, however, the bank was already targeted for a robbery by Dorian's minions – and when the fun-loving greenster gets there first, foiling their plans, he makes a solid enemy of the mobster.

Jim Mitchell supervised the sequence. "There was a practical explosion set up for when he bursts through the bank doors," Mitchell explained. "Then he does the vortex effect down the street, leaving a few computer generated bills flying behind him. Originally, we were going to do that with some practical elements on stage; but things like that are actually becoming easier to do in CG. To simulate that on stage, we'd have filmed a hundred shots just to get the one we wanted."

The Mask's arrival at the Coco Bongo club marks the beginning of one of the most complex computer graphics sequences in the film. Settling at a table, *The Mask* is overcome with love and desire as he watches Tina Carlyle's sultry performance. In reaction, he goes through a series of Tex Avery-style gags – his eyes pop out, his jaw drops, his tongue rolls out; his heart grows to ten times normal size and pounds through his chest; he turns into a lecherous, whistling wolf. The sequence presented more of an aesthetic challenge than a technical one. "Gags like that have been done in 2-D for decades," observed Steve Williams, "but it was a whole new ballgame to do them in 3-D. Eyes popping out in a 2-D cartoon are just there to be funny and to make a point. But in 3-D, in a live-action film, eyes popping out could be too grotesque. To make it realistic, you have to have veins there; but you also have to make sure the veins aren't so realistic that they make the effect horrific rather than comical."

"The balance between realism and style was always what we had to find," Scott Squires elaborated. "We were making these things photorealistic, but always in terms of the cartoon style. On the tongue that rolls out, for instance, we had to decide how wet we could make it without making it look gross. There was texturing on the tongue that was realistic; but it was not so perfectly real that it looked grotesque."

Paul Hunt animated Stanley's oversize heart beating madly from beneath his shirt – another classic cartoon gag. "That was a 3-D computer heart that was rotoscoped to his chest and then blended into his shirt," Hunt explained. "We built the shape of a heart and then we put a section of his shirt, with the buttons and everything, on top of that. So that whole area of his shirt gets pulled out into the shape of a heart. The CG element ended at his chest and was softly blended into the real white shirt he was wearing."

Conceptualizing the wolf-head transformation was among the more arduous of design tasks on the film. The model shop first sculpted a maquette for the digital team to use as reference. This initial concept represented a minimal transformation with Carrey's basic mask makeup merely augmented with a snout that suggested a wolf. Once in Steve Williams' hands, however, the transformation effect was exaggerated to reflect a more outlandish cartoon style. Rather than scanning in the three-dimensional maquette as a starting point, Williams built the wolf-head computer model from scratch, moving points in the computer until he achieved a wire-frame version of the desired look. That wire-frame was then animated.

A smooth transition from actor to wolf was crucial. "We built a CG model of Jim Carrey as *The Mask*," Squires explained, "and that was tracked with his real head. Then that transformed into the wolf head through 3-D computer animation. So we started with his real head, then we transitioned to a CG head, and finally we transitioned to the wolf head." The gag continues with *The Mask* taking a mallet and pounding his own wolfish head until it flattens down into his shirt collar. Dan Taylor animated the mallet and flattened Williams' wolf head model, adding CG stars circling overhead. Technical director Karen Ansel handled all the lighting on the shots.

Later in the sequence, Stanley joins Tina in a frenetic dance that includes a 'crazy-legs' effect in which the character's legs perform all manner of cartoonish moves – going unnaturally jelly-like in one shot, and twisting into pretzel form in another. "The crazy-legs shot took a long time," Jim Mitchell recalled, "because it was tremendously difficult. We knew we had to replace Carrey's lower body with CG legs, but we didn't have a clean plate and there were all these lights flashing around. All of us actually wondered why Chuck even wanted to add effects to this sequence, because it was really funny in the live-action plate as it was. Jim Carrey was doing this little dance and his legs were going everywhere and it was hysterical. I guess our job was just to push it even further."

Peg Hunter ended up erasing Jim Carrey's pants frame by frame, then Dale McBeath animated CG pants going into exaggerated positions – flying up to his head, twisting into a pretzel knot, then helicoptering out. "The problem for the technical director, Christophe Hery, was how to do the clothes," Mitchell continued. "It was one thing to move his legs around – we'd done the *Terminator* walking down the street in pants. But in this, Jim was wearing all this loose clothing and we had to simulate how the cloth would move. What it came down to was extracting his actual pants off the plate and mapping those onto our CG element."

The Mask next appears at Landfill Park where, through Stanley, Tina has arranged to meet the mysterious, yet alluring character. Sitting on a bench to await *The Mask*'s anticipated arrival, Tina and Stanley enjoy an unusually colorful sunset effected by the blanket of aerial pollutants permanently in place over Edge City. The sunset was achieved through another digital matte painting. "That was a difficult shot," Sandy Karpman noted, "because the actors were filmed against

a white screen, and the white bled into their edges. Barbara Brennan had to do a lot of massaging to make it work. Whitescreen is quick and dirty – a live-action crew can set it up very quickly, so it's an advantage to them – but it means a lot of extra time and work for us." The live-action film element featured only the two actors sitting on a park bench. "The bushes, the entire cityscape above the bushes and the methane gas sky were all done as a matte painting."

Unable to bring himself to confess to Tina that he is *The Mask*, Stanley slips behind some shrubbery and reappears moments later in full green regalia. In the course of his subsequent seduction of Tina, the police arrive in force, instructing him to 'freeze' as he leaps off the park bench to make his escape. *The Mask* takes their demand literally, freezing in midair with icicles forming on his body. "We shot two sets of plates," Ellen Poon explained, "one with Jim jumping off a bench, and another one with him on a stand, acting as if he was frozen. The shot of him frozen was separated from the background and then morphed into the shot of him jumping – so while he is jumping, he morphs to this frozen position." To enhance the frozen look, computer generated icicles modeled and animated by Paul Hunt were applied to Carrey's face and body. The look of the ice was achieved with a RenderMan shader by Euan Macdonald. The frozen body also had a layer of blue frost on it. "Carolyn Rendu painted frost for the entire body. Barbara Nellis then made some animated mattes so it would look as if the frost was forming randomly." It is not until Kellaway says 'Unfreeze' that the literal-minded Mask returns to normal.

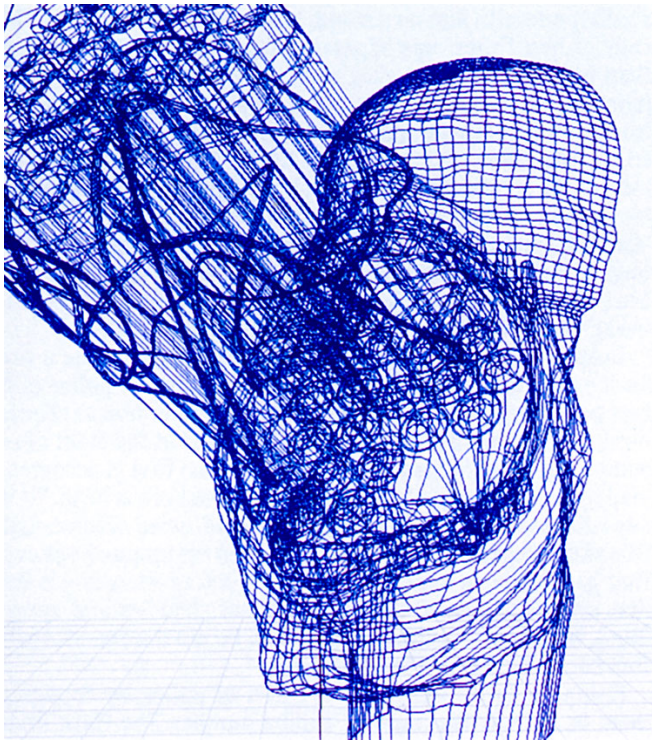
Despite the lieutenant's commands, *The Mask* makes a run for it – only to be confronted by a veritable army of police officers positioned just outside the park. In another nod to classic Avery-style cartoon gags, *The Mask*, horrified at the sight of so many guns pointed his way, lets out a scream that is accompanied by the sight gag of his skull popping out of his head. "It is one of those kitchen sink gags," Steve Williams commented. "His skull comes out of his head, and then his tongue pops out. That gag has been done a zillion times before – but this is the first time it has been done with correct shadows and everything. Tom Bertino animated that, and he did a wonderful job. Tom knows Tex Avery like nobody else."

Making a break from the battalion of police by engaging them in a Ricky Ricardo-like rumba number, *The Mask* finds an out-of-the-way corner where he can take off the mask and become, once again, Stanley Ipkiss. Although similar to the mask-wrap effect, the mask-pull presented the animators with a whole new set of problems. "Originally we thought that it could just be a kind of reverse action of the mask going onto his face," Jim Mitchell commented, "but as it turned out, that didn't really work. So we literally had to come up with a new design in the sense of how the geometry was built." Starting with a cyberscan of Carrey in makeup, the digital team built a three-dimensional computer model of *The Mask*'s head. Texture maps detailing the wood grain of the mask were painted by Carolyn Rendu, then applied to the three-dimensional geometry by technical directors Andy White and Habib Zaragarpour. "When he pulled the mask off, it was kind of like a morph because even though there was 3-D geometry, it was constantly shape-changing. We were trying to create a sense of the mask changing expressions as it came off, rather than just being this static shape. The difficult thing for the animators – Les Major and Bill Fletcher – was that in the process of pulling the mask off, they had to retain Carrey's expressions. In the plate, Jim was grimacing and wincing as if he was in pain as he pulled this thing off – but that was all covered up once we put our CG element over it. So the animators' job was to recover those expressions, making

the brows curl up and the jaw contort a little bit." Another problematic element of the effect was making it appear as though Carrey's fingers were gripping the edges of the mask. "His hands had to interact, as if he was literally pulling a piece of latex off. A lot of it depended on Carrey's ability to pantomime pulling something off when there was nothing there – and he did a great job of that. He was amazing in his ability to visualize exactly what we needed as far as interacting with elements that weren't there and that wouldn't be there for another six months. In every case, he took the effect halfway for us; and then we just had to come up with the follow-through."

Squaring off against Dorian and his gang, The Mask pulls an arsenal of computer generated weaponry from his pockets. Although replicating the look of metal was standard computer graphics fare, the digital superguns occupied so much space in the frame that an enormous amount of detail was required in the modeling phase.

In order to rescue Tina – who is tied to a tree next to a giant ticking bomb – The Mask grabs the bomb and swallows it whole.



To achieve the shot, the dynamite bundle and a section of The Mask's face were first modeled in wireframe form.

The wire-frame was then animated and match-moved to the live-action plate photography.

Cornered and desperate, Stanley is rescued by Peggy Brandt (Amy Yasbeck), a reporter out to get the scoop on *The Mask*. Peggy takes Stanley to the press room of her newspaper, ostensibly to hide him, but when Dorian shows up with his thugs, it is clear she has sold Stanley out. Aware of its powerful magic, Dorian steals the mask and drops Stanley off at the police station where he is very much a wanted man. Incarcerated behind bars, Stanley says his good-byes to Tina who reveals to him her intention to break with Dorian and his gang. Just outside the jail, however, Dorian captures her. Hearing her screams, Stanley escapes – abetted by Milo – and arrives at the Coco Bongo Club for a final confrontation with Dorian.

The bomb as finally rendered. Because the CG model was to be seen in extreme closeup, details such as lighting and skin texture had to be meticulously applied in the rendering stage.

Inside the club, tied to a prop tree beside a massive dynamite bomb, Tina implores Dorian to remove the mask – which has endowed him with the looks and power of a monster – so that she may kiss the real Dorian one last time. Falling for the ploy, Dorian removes the artifact and, as he does so, Tina kicks the mask into the air, where it is caught by Milo. What follows is a sequence in which Milo dons the mask and becomes a canine superhero who helps to bring down the villains. Ellen Poon was the CG supervisor for the sequence, while Tom Bertino supervised the Milo animation.

The Mask's stomach balloons out as the bomb detonates inside him. During the live-action photography, Jim Carrey mimed his reaction to the imaginary explosion. ILM then stretched his stomach area digitally.

To start the sequence, ILM was given live-action elements which featured the dog – a Jack Russell terrier named Max – sticking his snout into the mask, as if putting it on. "Max was really clever," stated Poon. "He would put his head into the mask on cue, and then stay like that for a while since the mask was supposed to be grabbing his head in the shot." The next shot of Milo reveals that the mask has made him into a buffed-up version of his former self. ILM modeled and animated a Mask version of the dog's head to replace his original head. "The interesting part about this sequence is that we were adding a very over-the-top cartoony head onto a live-action dog," Poon observed. "Benton Jew, the art director, created dozens of designs and drawings to develop the look of Milo. It still had all the characteristics of a Jack Russell terrier; but it was green and bigger and slightly meaner looking."

After absorbing the blast without apparent ill effect, The Mask reacts with a burp of fire. Flame elements – still difficult to simulate with computer graphics – were achieved practically, then inserted into the shot.

Paul Hunt's first attempt at modeling Milo's altered head was based on a design generated by the production art department. "I built that design in the computer and it was decided that it was a bit too ferocious," Hunt recalled. "Chuck Russell wanted Milo to be lovable, even in his 'superdog' form. So we played with the design – I manipulated the data around to make it look more like the original dog. In the end, it became just an exaggerated version of a real Jack Russell terrier head. The new model looked much friendlier; yet it was a design we felt we could use to get a full range of emotion."

After the new model was built in Alias, it was taken into Softimage for animating. "We added skeletal chains, determining how we should break it up so that it would animate well," Hunt said. "Because the character was an exaggerated cartoon character, rather than a real dog, he had to behave in an exaggerated manner. When he barks, he doesn't bark like a normal dog; he opens his mouth and his jaws get bigger, and his teeth grow." As finally rendered, the Milo head had the same stylized Mask look seen in the Jim Carrey sequences, but still suggested the look of a dog. "There is a hint of fur on the head, and we retained some of his markings. Anything that was brown on the dog turned green, but there were still white areas."

The sequence ends when the dog jumps onto a chandelier, lifts his leg, and urinates on one of his attackers below. In what was no doubt a first in the digital arena, Bijan Forutanpour composited a stream of computer graphics urine onto Milo that was rotoscoped to the appropriate area. As Milo leaps off the chandelier, a barrage of machine gun fire is directed at him. "Obviously we couldn't have bullet hits going off on the chandelier when the dog was still standing on it," Ellen Poon noted, "so two passes were filmed – one with the dog jumping off the chandelier; and another with the bullet hits, but without the dog. Those two shots were later combined."

The Milo sequence ends with Stanley capturing the dog and pulling the mask off his face. Because Max was a less expressive performer than Carrey, the Milo mask-pull did not require the same face-

distorting imagery that had been devised for the Carrey mask-pull effect. “With Milo, there was a distortion of the CG imagery, but not of the original dog imagery,” Hunt explained. “I left tentacles sticking to him that snapped back as the mask was being pulled off.”

Again in possession of the mask, Stanley transforms into his powerful alter ego and brings out the big guns – literally. Confronting Dorian and his gang, *The Mask* – doing a Dirty Harry impression – draws out two huge ‘superguns’ that nearly fill the frame. “The gag there,” Jim Mitchell commented, “was that he was pulling these huge guns with all of these gadgets on them out of his pockets. Kyle Odermatt modeled the superguns, and Chris Armstrong animated them. There was so much detail and geometry on them that it got to a point where it almost equaled the T-rex in *Jurassic Park*. So Chris had quite a job animating these things. The real trick was to match what Carrey was doing with his hands, and also to portray the weight that you would expect from these huge guns. Andy White did the rendering and technical directing.”

When Dorian and his gang open fire on *The Mask*, he evades the gunmen and rushes to Tina – who is about to be blown away by the ticking bomb. Arriving at her side just in time, *The Mask* literally swallows the bundle of dynamite moments before it ignites. The effect required a CG ‘prosthetic’ mouth and jaw that could open wide enough to accept the CG dynamite. “What made the ‘eating TNT’ shot challenging,” stated Sandy Karpman, “was that it was framed as a full-face closeup of Jim Carrey, thus making our CG prosthetic quite large in frame. In fact, there was more CG in frame than there was Jim Carrey. The CG prosthetic was the whole lower face, from the top of the cheekbone down to the jaw, and back to where the ear would be.” In order to match the digital prosthetic perfectly to Jim Carrey’s on-set makeup, Susan Ross hand-painted the digital mask to match the lighting and the real prosthetic’s color and orange-peel texture.

The dynamite was a CG element that was positioned to move with Carrey’s hand as he pantomimed the action of bringing the bundle to his mouth. For the subsequent shot of his swallowing the explosives, animator Dale McBeath was faced with the task of making *The Mask*’s neck expand to make room for its passage. Carrey mimed a big swallow and moved his body as if the bomb was working its way down his throat and torso. “Then he arched his back as if his stomach had a big explosion inside of it,” Karpman noted. “We built off of that, adding a major stretch to his stomach area. Then he burps smoke and flame and says, ‘That’s a spicy meatball.’ The flame and smoke were done as composited practical elements. Smoke and flame are still very difficult to do in CG, so there was no reason to do that digitally when it was so much easier to do it practically.”

The Mask’s final confrontation with Dorian ends with the mobster falling into a fountain and – with the help of a quickly rendered cartoon-style flush handle – being flushed down a drain in a whirl of water. “The trick for us was to simulate water,” Jim Mitchell noted. “All we had to work with was a two-foot-deep pool of water on the set. There were lights coming up from the bottom, and water was dropping into it from the fountain; but there was no real action to the pool itself. We searched high and low for footage of whirlpools and things like that to use as reference for the look of this thing. The best that we found was a shot from Moby Dick in which the whale starts circling the ship and causes a vortex of water.”

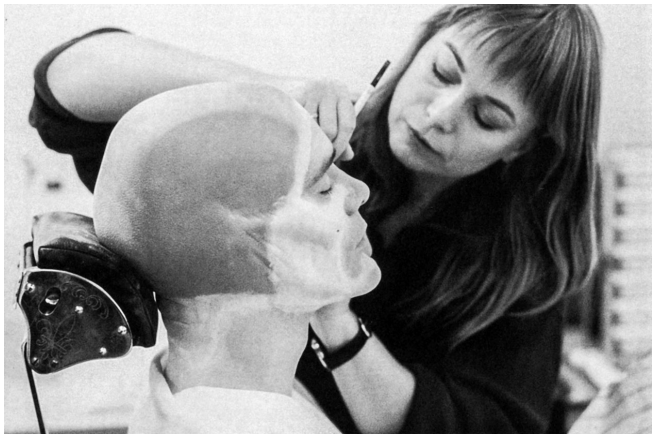
Starting with the scanned-in element of the static pool of water shot on the set, Mitchell and his team began manipulating the imagery. “We were able to distort that surface into a funnel shape. The geometry itself was quite simple – very lowrez type of data. The difficult thing was making it look right, because water is a natural phenomenon that is always difficult to do in CG. The look of it became primarily a matter of rendering – which was done with RenderMan. Even though the pool on the set was only about two feet deep, when we finished the shot it looked more like eight feet deep.”

An element of Dorian was also incorporated into the funnel. “Scott Squires shot Peter Greene on a huge turntable on one of our bluescreen stages,” Mitchell explained. “That gave us the action of Dorian spinning around. We took that element and extracted his upper body. That became the point at which we would animate a water line so it would look like he was sinking as the shots progressed. Also, because he was filmed on a dry platform, we had to darken his clothes to make him look wet.” Interaction between Dorian and the digital water effect was enhanced by the addition of practical water splashes filmed on stage. Further finessing was needed for the final shot in the sequence. The production had filmed the fountain drained of all its water, but the empty pool footage did not cut in well at the end of the draining effect. Eric Chauvin was therefore called in to do a matte painting of the empty pool – complete with drain at the bottom – which hooked up more convincingly with the preceding digital work.

The Mask ends with Stanley and Tina overlooking the harbor. Now confident that he can make it on his own, without the power of the Viking artifact, Stanley allows Tina to throw the mask back into the water from which it came. Though Carrey and Diaz were photographed on location in Los Angeles, the director was unhappy with the setting and requested another digital matte painting to improve the view. “Yusei Uesugi did a painting of the entire background view,” Karpman said, “which was about seventy-five percent of the frame. Jim and Cameron had not been shot in front of a bluescreen, so we had to pull them from the real plate and put them in front of the painting. All we kept of the plate were the actors and part of the city way to the left of screen. The rest of the frame was a matte painting that had a reservoir full of water, a boat, beautiful buildings, green lawns and some freeway structure.”

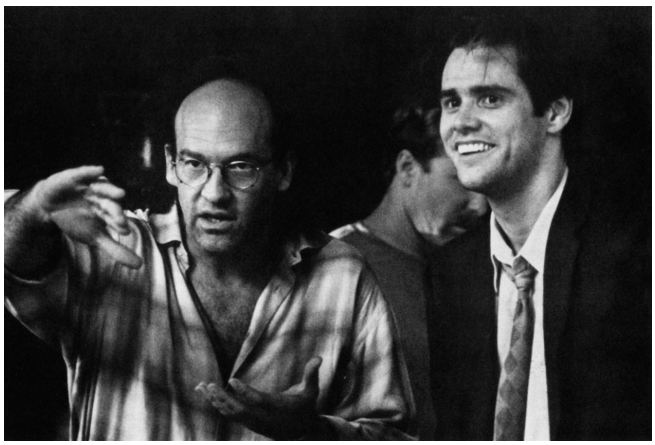
Once again, ILM delivered the goods on a project that demanded the exploration of new territory in computer generated effects. “The difference in this show from any others,” Steve Williams noted, “was that we had something like ninety-one shots – that’s twelve minutes of animation. And each of those shots had a different problem to be solved. Almost every one required a separate model. They weren’t as complex as the models in Jurassic, of course – in a cartoon joke you can bend the rules a little bit – but there was still a lot of work required for each little gag. Unlike Roger Rabbit, we were taking 3-D animation and making it fit into the real 3-D world. And we were playing it for comedy.”

The Mask was only about three months shy of its release date when an extremely positive screening for studio executives led to the approval of additional effects shots – all of which Russell had wanted from the beginning. However, with ILM already pushing to meet the delivery deadline for its original slate of shots, Russell decided to bring Dream Quest Images and supervisor Jon Farhat – with whom he had worked previously – onto the project. Dream Quest took on approximately forty-eight shots, including wire removals, that had to be realized in an extraordinarily short time frame. "For the most part," Farhat said, "we had to take the point of view that there was not going to be time to generate completely computer graphics scenes. So we had to shoot stage elements and then take them into the digital world to manipulate them."



The Cannom Creations makeup – applied on set by Cheryl Ptak – consisted of several appliance pieces, including a large head piece, exaggerated cheekbones and an extended jaw. Its most prominent feature was a set of enormous teeth meticulously crafted and fitted to Jim Carrey's mouth. Approximately three hours were required to apply the makeup.

Among the effects digitally manipulated by Dream Quest were a variety of cloud tank elements generated by Gary Platek of JEX-FX, some of which were intended for the deleted Viking sequence. More aggressive were cloud shots for the scene in which Dorian first dons the mask. "For that, Gary shot cloud tank elements which we scanned in, then manipulated to create this swirling cloud effect," Farhat explained. "Chuck wanted billowy clouds spiraling around Dorian's body – but he specifically didn't want CGI clouds since this was the bad guy and everything about him was more realistic. So I told Gary to shoot these cloud elements as if we were going to do nothing to the shot digitally." For the cloud tank shoot, Dream Quest designed a unique spiral injection tube for the paint. "It was a very thin corkscrew, with holes all around it. Gary would set that into the water, slowly push the corkscrew down and that would create clouds billowing around the leading edge. It looked great, but we ended up with a shot that was twelve seconds long, and we needed it to be three seconds. So we scanned in the shot and did a six-to-one time compression with our time-compression software – taking six frames and averaging them so that we wound up with only one frame. That gave us an element that went really quickly. Then we had to pull mattes on that element, which was difficult. Cloud tank elements are contaminated – there is particulate all over the place – so pulling a matte is hard. Next, because Dorian was not shot against bluescreen, we had to hand-roto him and hold him out to get this cloud element to go around him."



Chuck Russell – a horror film veteran who steered the comic-based project away from its dark origins and into a lighter realm – discusses a scene on set with his star.

Dream Quest also contributed shots in which *The Mask* performs a quick series of transformations at the Coco Bongo club and is rewarded with a standing ovation by a foreground audience in silhouette. *The Mask* spun into each transformation in a shortened version of the previously established vortex effect. “Chuck liked the idea of time-compressing those shots,” said Farhat. “He wanted to speed up the action, but he didn’t want a jumpy quality. So we read in the frames, time-compressed them, and output new frames – without that steppy look. Then we had to create a performance that worked within the context of the picture; so we did an animatic – just a very rough thing – and showed that to the director.”

Having established the look of the spin through the animatic – and keeping in mind that it had to emulate ILM’s vortex effect – Farhat and the Dream Quest crew began working with plates provided by the production. “They provided us with the ‘before’ and ‘after’ of each transformation. We hooked them up and did the spinning effect, which had to act as a cross-dissolve over fifteen frames. Unlike the ILM shots where the character spins around for six seconds and you see the geometry changing, this had to be achieved in fifteen frames – in fifteen frames we had to go from a guy dressed in black and orange and yellow, or whatever, to a guy dressed in purple. So we generated some computer graphics tornado elements. We began by taking a model – which was a series of rings – and we isolated the character from the A section and the B section. Then we took the character and duped him over a frame – it was as if we just put him on a xerox machine. Then I texture-mapped that around the rings model for both the A side and the B side. Now there were two sets of rings that had two different texture maps on them. In essence, I made a movie that went from A to B in a cross-dissolve; then I took that movie and wrapped it around the rings model. When we spun the rings, they would cross-dissolve from A to B.” The spinning rings model was then filtered through a series of motion blur filters. “The final element was composited in the blank section between the two sides of the live-action, overlapped onto the A and B sides. Then, at the very end, we had to go in and hand-paint the hookup points, just to smooth them out.”

Dream Quest also realized the shot of the audience standing in silhouette. “What made that shot difficult was that we went in with the idea that they were going to shoot thirty people standing up in two rows,” Farhat commented. “But only eight people were shot, so we had to augment the crowd. We decided to do it optically since it was such a long shot – something like eight hundred frames. All eight people were duped, flopped, inverted and then put back together. So it was an elaborate shot to do optically.”

Also on the Dream Quest agenda were scenes of Dorian’s elongated serpent tongue that were originally intended to be filmed using Cannom *Creation*s’ mechanical head. Employing Alias software, Dream Quest’s digital team built a spline-based CG tongue. Just as ILM had had to address the problem of balance between realism and cartoon style in its effects, Dream Quest was faced with the problem of how realistically they should render Dorian’s tongue. “Because Dorian was the evil character, we felt he should also be more real than the Jim Carrey cartoon character. So we made the tongue very realistic.” Complicating the tongue shots was the fact that in the plate photography, Peter Greene had stuck out his real tongue and moved it around. “It was every place it didn’t need to be,” Farhat groaned. “Dan DeLeeuw took the CG tongue and tracked it so that it moved correctly with Dorian’s head. At that point we had this animated tongue that worked, but we still had his real tongue underneath it. So, frame by frame, we had to paint the old tongue out.”

The Dorian mask sequence was also enhanced with glowing eye effects. “Every time Dorian got angry, his eyes glowed red,” stated Farhat. “We had to track every single frame of his head. Once we had the eyes rotoed and tracked, our conventional animation department created the eye-glow effect. Then we just took it into opticals and printed it through the interpositive. Something simple like that would have been a whole rigmarole in digital. There are still some things that work better and more easily in optical. We did something like ten of those shots and they are crisp and sharp and beautiful.”

Dream Quest’s final contribution to *The Mask* was a number of wire removals. “We did tons of those,” said Farhat. “Every time the mask is flying across the room, every time there was an effect where things flew apart, there were wire removals involved. There was a shot where Dorian threw Tina up into the air. To get the shot, the production had built a gantry-type rig which we had to remove. We also had to remove the shadow that the rig cast on the far wall. It was a nightmare. Those were some of the most aggressive wire removals we’ve ever done.”

The release of *The Mask*, and its subsequent blockbuster showing at the boxoffice, was significant for all involved. For New Line Cinema, it was the launching of the company’s first bona fide mainstream hit. For Jim Carrey, it was the defining moment in a push for movie stardom that had begun with *Ace Ventura: Pet Detective*. For Dream Quest and ILM, it signified yet another successful exercise in pushing the envelope of digital technology. “This show is another big step in CGI development,” Scott Squires noted. “We had *The Abyss*, *Terminator* 2, *Jurassic Park* and now *The Mask*. Each one took CGI to another level – we’re not just repeating the same old things. *The Mask* has taken CGI another step up the evolutionary ladder. We’ve finally been able to take surreal cartoon concepts and apply them to the real world – and that is something new in our bag of tricks.”

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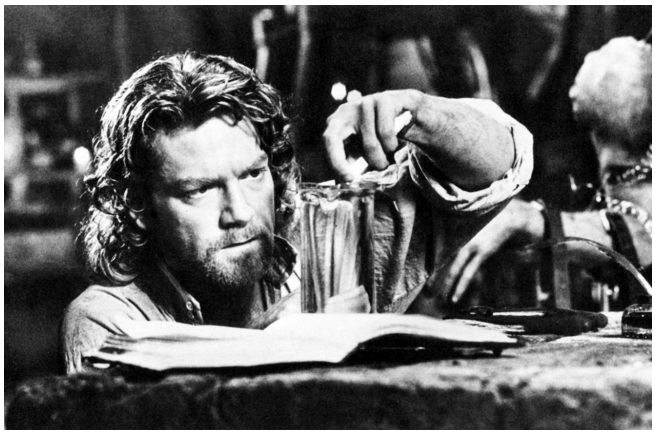
HAUNTING CREATION

image

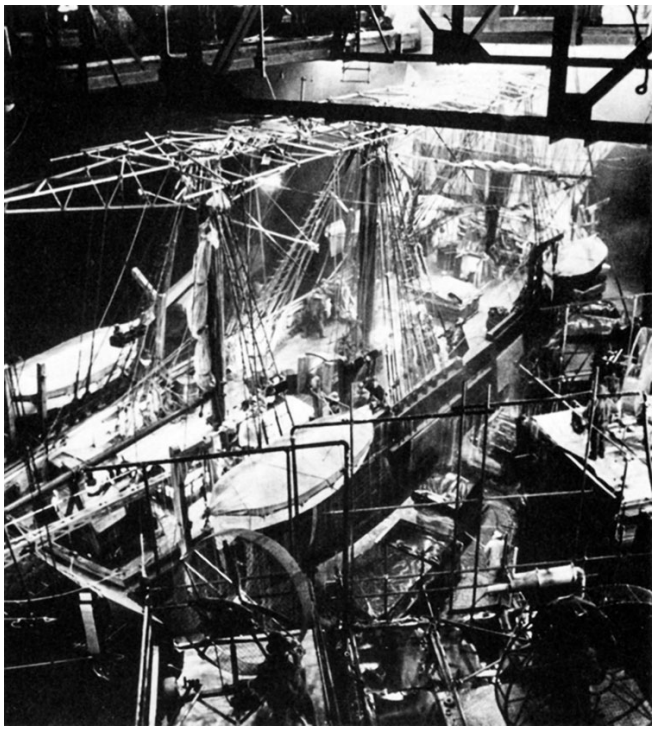
article by
Mark Cotta Vaz

In the summer of 1797, the British Isles were battered by a strange succession of tempests, floods and terrifying electrical storms. On August 14, during a break in the inclement weather, a fiery comet suddenly appeared in the heavens above the London area. The comet could be viewed for eleven succeeding nights of sudden calm. An expectant couple – Mary Wollstonecraft, a pioneering feminist, and her husband William Godwin, a radical philosopher – saw the comet as a special star heralding the coming birth of their child. With the passing of the comet the fearful storms returned. On August 30, as the clock neared midnight, Mary Wollstonecraft gave birth to a daughter – and died soon thereafter from complications.



In a dual turn as director and star of Mary Shelley's Frankenstein, Kenneth Branagh portrays Victor Frankenstein, the obsessed young scientist who artificially creates life, in this latest retelling of the gothic horror classic.

Eighteen summers later, Mary Godwin, the child who had come in on a comet, was on holiday in the Swiss Alps, staying at a little cottage on Lake Geneva with her married lover – and soon-to-be husband – Percy Bysshe Shelley and her half-sister Clare. A short hike away was the Villa Diodati, an estate occupied by the poet Lord George Gordon Byron and his physician John Polidori. The serene weather that had greeted them suddenly became tempestuous, and torrential rains and electrical storms forced the party to huddle together in the salon of Diodati. The brew of cosmic weather, exotic discussions on the possibilities of animating corpses and creating humanoid life, and a parlor game challenge of crafting a ghost story induced in Mary the waking nightmare that would inspire her novel *Frankenstein: The Modern Prometheus*,



The film opens on a storm-tossed sailing ship – actually a large-scale set piece built on a blacked-out soundstage and mounted on a gimbal. To simulate a ravaging sea, hydraulic rams rocked the ship in concert with wind

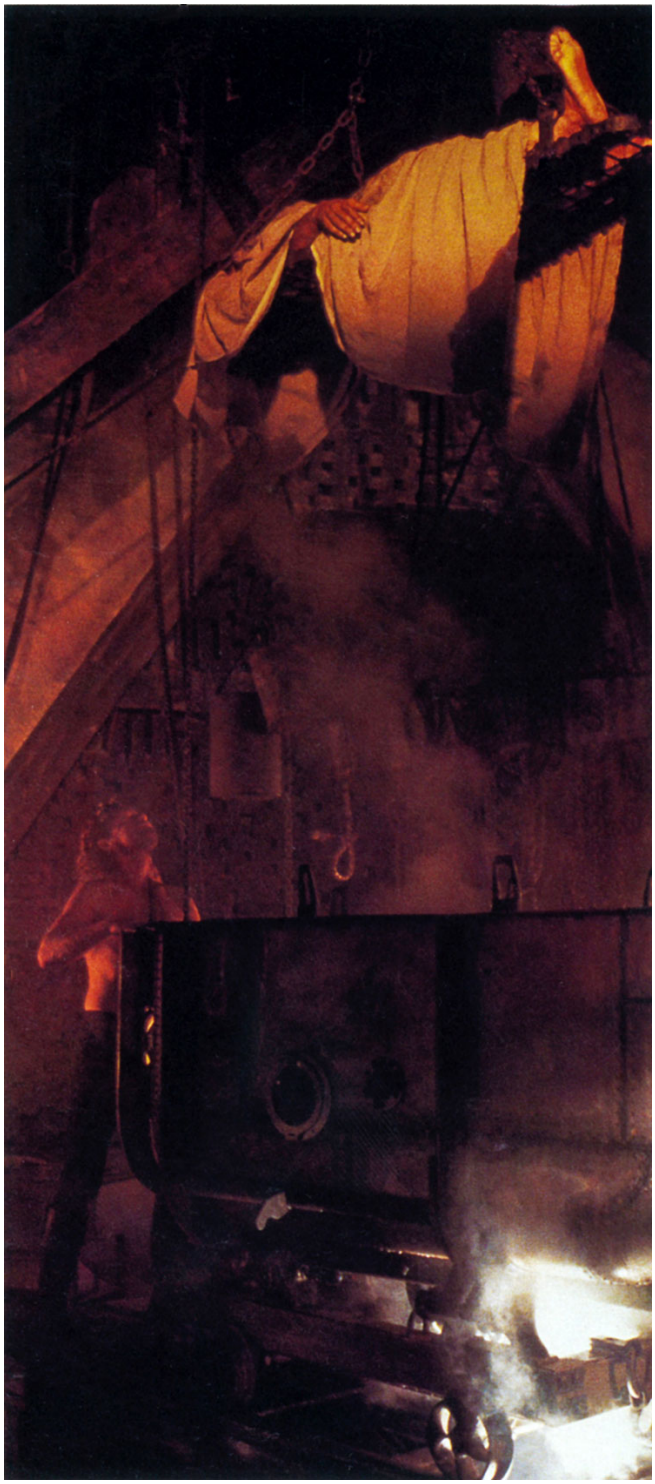
Mary Shelley's *Frankenstein* – a TriStar Pictures release directed by Kenneth Branagh – is the latest screen version of the classic tale of the obsessed

scientist who brings to life an inanimate creature of his own design. The first movie adaptation of the tale was a 1910 Thomas Edison production; but it is the 1931 Universal Pictures incarnation – advertised on one-sheet posters as *Frankenstein*: The Man Who Made a Monster – that has haunted the public's imagination with such iconic images as the mad scientist hysterically assuming godlike powers, the mute monster with neck bolts and the torch-waving mob of villagers bent upon destroying creator and creation. Although a classic film was created – one that helped define the horror movie genre – the true nature of the creature in Shelley's novel was expunged in the process.

machines and torrents of water released from tin-tanks positioned on four surrounding towers.

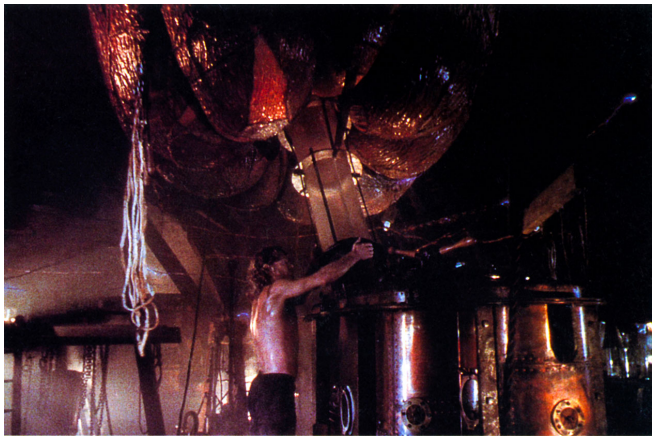
looking buoyancy.

Kenneth Branagh was completing postproduction on *Much Ado About Nothing* when Francis Ford Coppola's American Zoetrope company – having previously gone to the source to resurrect another horror classic, Bram Stoker's *Dracula* – first approached him to direct the definitive film version of Shelley's novel. Branagh, a noted Shakespearean actor and director whose acclaimed Henry V had astonished the film industry and garnered him international recognition, saw tremendous potential in the novel. "Although I was never a horror genre buff, when the project first came up I went back to the book and discovered much more than just a horror story. It contained all sorts of psychological detail about relationships and families and the moral dilemma concerning the limits to which scientific investigation should go. It dealt with the themes of parenting and responsibility, of birth and death. I kept seeing images of an infant delivered and then abandoned, frightened and screaming for attention. The combination of all those elements convinced me that it was a great subject for a contemporary movie – an epic movie – not just about a mad scientist and a Neanderthal creature, but about real people."



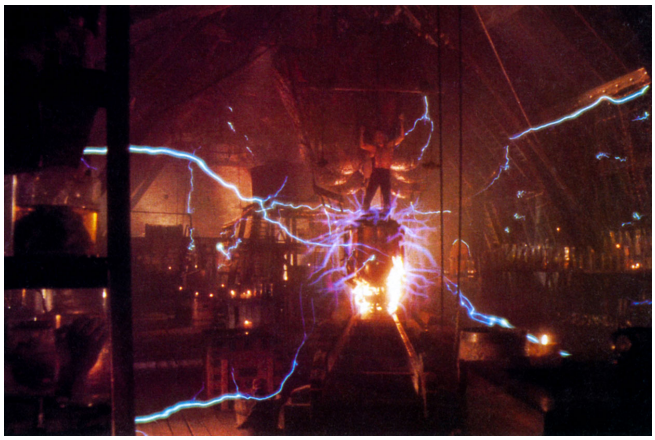
During an elaborate creation sequence, Frankenstein lowers his inanimate creature into a giant copper sarcophagus filled with amniotic fluid. The laboratory set – conceived by production designer Tim Harvey and outfitted with scientific paraphernalia by special effects supervisor Richard Conway – was fashioned with an eye toward period authenticity.

Principal photography for Mary Shelley's *Frankenstein* began in late October 1993, with Branagh cast in dual roles as director and star. "It just seemed natural to do both. In taking on such a project, the drive and the obsession needed to push this great big articulated lorry of a film through its stages of development would require some of the same demonic energy that Victor Frankenstein possessed. So there was kind of a bleed-through of roles – and I just saw myself in there as a brick in this wall that I could count on."



Using electricity and other inducements to instill life in his creation, Frankenstein inserts into the sarcophagus a tube attached to a giant sack filled with electric eels. Four-foot animatronic eels traversed the tube on tracks, articulated via a system of cables and levers.

As Branagh and his artistic team embarked on the project, prior film adaptations of the *Frankenstein* myth were the farthest thing from their minds. "Despite the risk of not delivering on audience expectations," Branagh stated, "our intent from the start was to go with a distinctly different approach. That seemed to be the only point in doing it." Production designer Tim Harvey likewise found very little relevance in the 1931 movie version. "You've got to admire the Karloff film as a great artifact," Harvey noted. "But it wasn't appropriate to what we were doing, so we were never tempted to be drawn that way. I certainly did not go into this thinking we were going to make a new icon for future generations. I just went into it thinking, 'Let's make a really good film.'"



Intensifying the sequence were electrical discharges and sparking effects – some created on set with a large Tesla coil, but most added later by Computer Film Company using special software written specifically for the task.

Except for brief shooting forays to the Swiss Alps and some practical miniature work in the sea off the Welsh coast, the entire production would be staged in England on the backlots and soundstages at Shepperton Studios. "Because this was a larger-than-life gothic story," Branagh remarked, "it required the right kind of backdrop. Tim and I agreed that what was needed was to create a world that had sort of a heightened reality. It had to be full of primary colors, full of scale and space and, where necessary, light and sunshine. Putting the story in a natural setting would not have been appropriate. The only way we could maintain total control – and achieve a consistency of style and tone – was in a studio environment."

In addition to Tim Harvey, Branagh's creative team included art director Martin Childs, director of photography Roger Pratt and costume designer James Acheson. Physical effects would be coordinated by Richard Conway, composites would be rendered by Computer Film Company, and the all-important makeups would be entrusted to Daniel Parker and his Animated Extras studio. Joining in the effort to capture the spirit of the original novel was an acting ensemble led by Robert De Niro as the creature and Helena Bonham Carter as Victor's adopted sister and true love

Elizabeth. For Harvey – who had designed all of Branagh's previous films – the adaptation of Shelley's novel would be his most ambitious partnership yet. "Ken wanted the sets to have detail – but not a quirky, gothic detail with a lot of weird, leering gargoyles. That would be clutter, cliché. The idea was to sweep the canvas clean and let the action speak for itself, rather than trying to over-embroider."

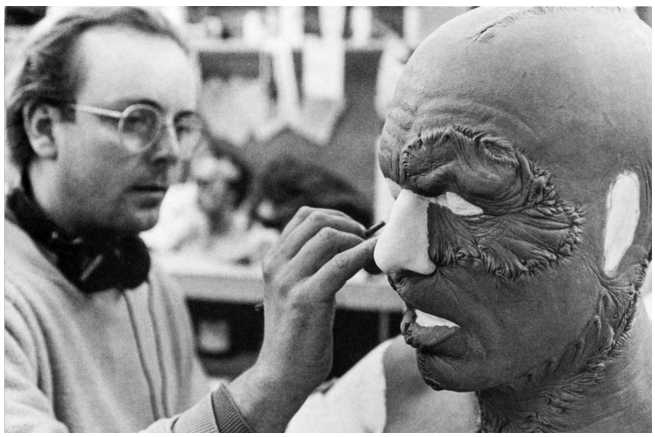
Having forsaken the vagaries of location work for optimal control, the production had to create environments of daunting complexity. Shelley's novel covered such disparate terrain as the icy seas of the Arctic, the university town of Ingolstadt, and the laboratory sanctum where *Frankenstein* would create life. The greatest design challenge was recreating the vast desolation of the frozen north on an enclosed soundstage. "These days you don't build soundstage sets like the Arctic," Harvey asserted. "You usually go out into the real world and shoot at least a substantial part. But in order to keep control, we decided not to do that. Although it was difficult for us to bring off on a soundstage, we would have certainly lost lives if we'd shot in the Arctic."

Both the book and film open with a sailing ship captained by Captain Robert Walton (Aidan Quinn) on a pioneering expedition to the North Pole. The ship becomes stalled by a storm and lodged in a sea of ice. It is from that icy wasteland that the ship's crew plucks the dying *Frankenstein*, who recounts his strange story. In addition to the soundstage set – which would be enhanced in the digital realm – wide shots of the opening storm scene were realized with a miniature ship. Instead of shooting in a controlled environment, Richard Conway and his crew opted to film their quarter-scale model in daylight during an actual storm at sea – with Computer Film Company digitally adding a cast of night over the footage.

"We used a fishing trawler and a ten-millimeter cable to tow the miniature out to sea," said Conway, "and we shot it day-for-night in an actual Force 8 storm. With the quarter-scale model, twelve-foot breakers looked like fifty-foot waves." Because a natural-looking buoyancy was important to making the scale convincing, the ship was constructed out of heavy materials. "We constructed the model in steel with a wooden shell and filled it with rigid polyurethane – so it was just impossible to sink. It also had a keel – an oblong frame into which we laid concrete railway slippers to give it nearly eight tons of weight underneath. Because it was weighted so heavily, the boat rode the sea very nicely."

Its soundstage counterpart was a three-masted sailing vessel approximately ninety-five feet long and twenty-three feet wide, trapped in a sea of solid ice created with 23,000 cubic feet of polystyrene. To simulate a major storm at sea, Conway and his crew built the ship on a frame operated by a powerful steel gimbal, its central spindle constructed from the floor sections of a tower crane. While hydraulic rams would rock the ship – suggesting a boat tossed by rough waters – the full fury of the storm would be supplied through elaborate staging. "We decided not to flood the stage, just have the set completely blacked out," said Conway. "We would provide all the textures of the storm using wind machines and tip-tanks with water." Four towers – concealed behind curtains of black velvet – were positioned around the ship and rigged with chutes and two-thousand-gallon water tanks. "When the tanks were released, they tipped over and the water shot down the chute. The water then hit a ramp at the bottom of the tower where we welded diffusing plates to break it up as it shot over the boat deck. The water would come from beneath the black velvet so it looked like it was the sea crashing over from below the gunnel of the ship. I really wanted to get a good

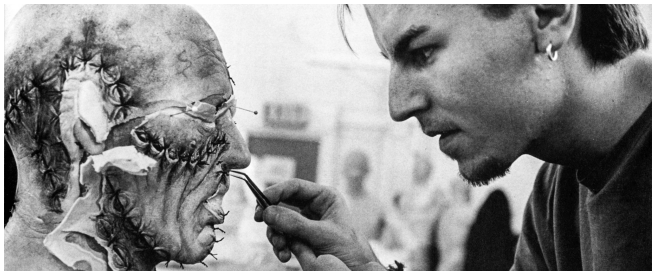
bough wave, with the boat dipping into the waves. I had never seen this kind of shot done with tip-tanks before, and I wanted to try it. Of course, it had to be done in concert with the rocking gimbal; but when we hit it just right, it really worked."



Over a lifecast, makeup artist Mark Coulier sculpts one of many prosthetic pieces needed to create the patchwork being Victor Frankenstein has assembled from the dead. Under the direction of makeup supervisor Daniel Parker – head of Animated Extras – the formidable makeup endeavor required months of research and development and broke new ground in prosthetics design.

In the Animated Extras foam lab, technicians Steve Tyler, Derek Marsh andm Daniel Nixon inject foam latex into molds. Complicated collapsible molds were designed to produce prosthetic pieces that were seamless on the outside.

The scene ended with an enormous iceberg that seemed to thrust malevolently out of the waters to halt Captain Walton's ship. With the passing of the storm, and ensuing scenes of the ship trapped solidly in the ice, the production had to simulate the foreboding expanse and the eerie, overcast pallor of the arctic twilight. Both the large-scale ship and the soundstage set were redressed to create an ice-locked environment. Stage footage was turned over to Computer Film Company, where the massive iceberg that stops the ship was added digitally, as were misty skies and background icebergs.



Researching old medical tomes and mortician's manuals, Parker and crew duplicated crude surgical and stitching techniques authentic to the period depicted in the film. Assistant makeup artist Callum King glues individual sutures onto a prosthetic head piece.

"We did a lot of experimentation on the look for the North Pole," said CFC producer Chris Watts, whose company produced some 140 digital composites for the film. "When it was originally shot, no one knew they were going to have to do some image processing in postproduction. So when the scene was in rough-cut form, my team of designers and I sat down with Ken Branagh, Roger Pratt, Andrew Marcus, the editor, and David Barron, the associate producer, and traded ideas on what the scene needed. Everybody liked the notion of providing a cold look by desaturating the film, digitally removing a portion of the color and pushing it toward black-and-white. We agreed on a basic level of desaturation, and also added a lot of mist to the sky. The desaturation process was fairly simple, but the sky replacement was a bit more difficult in that almost none of the shots were locked off. Because the camera was moving, we had to paint a representative sky and track it, or pull a matte and replace the matte with sky."

CFC also added icebergs, including the mountain of ice that halts the ship at the end of the storm sequence. "The iceberg that the ship crashes into comes boiling up out of the ocean seemingly of its own free will – as if it were actually trying to stop the ship," Watts remarked. "For that one shot, we made a three-dimensional iceberg using Wavefront and tracked the motion of the iceberg to the motion of the camera. We also had to paint in a lot of boiling water around the base of the iceberg. Designer Dominic Parker used Kinemation to animate water rushing down the sides of the iceberg."

Digital enhancement was also required to provide the background icebergs since the original soundstage photography had been shot against black without significant background scenery. "There wasn't room on set to provide a vista of receding icebergs," Watts explained, "so we created that digitally. We took some foreground iceberg set pieces, and in digital we just pinched pieces of iceberg and moved them over to other places in the frame as needed, making adjustments so they kept perspective and followed the movement of the camera. We also used iceberg elements that had been shot separately – polystyrene props ten to forty feet high – and scanned them and tracked them into shots as 2-D images. We manipulated each one so it looked a little different, even though it was all pretty much background stuff and relatively out of focus."

For Branagh – unfamiliar with the realm of digital effects – the experience of working with Computer Film Company was both educational and at times frustrating. "I placed myself in the hands of the experts," Branagh admitted. "They're a terrifically inventive company, and I was

fascinated with the work; but it was still nerve-wracking. I would worry whenever I was putting things together and waiting on complicated opticals, never quite sure if they were going to work. But then, when the rushes came through for those shots and everything was the way I had envisioned, it was an enormous thrill."

The early set pieces – ranging from the *Frankenstein* family mansion in Geneva to the university town of Ingolstadt where Victor schools himself in the secrets of reanimation – were designed to reflect the emotional progression of the story and its characters. "For the *Frankenstein* mansion, we wanted to get away from the idea of the sinister castle," Tim Harvey commented. "At the beginning, it is a happy family home; but later on, of course, it is the scene of all sorts of drastic events. It was a tricky set because we had to embrace the feelings of both those moods. That same set was designed so it could be lit and shot in a variety of ways to change the mood."

Within the walled city of Ingolstadt, the atmosphere is one of pervading gloom as the populace is wracked by a cholera epidemic and the dead and dying are everywhere. The studio reproduction of the university town, an amalgam of period places Harvey had seen throughout his own travels, was erected on 70,000 square feet of Shepperton's backlot. One of the biggest exterior sets ever constructed in England – rivaling the Gotham City set for *Batman* – Ingolstadt occupied a workforce of fifty for more than four months.

"The design of Ingolstadt was an attempt to show a place that was suppurating," said Harvey. "The town is riddled with disease and, incidentally, by the sort of diseases of the mind that allow people like *Frankenstein* to act upon their ungodly ideas. So this is reflected in the decay and rot done with glazes and paint work. We achieved a strong graphic statement with large expanses of decaying stone walls that were true to Middle European walled cities but much exaggerated."

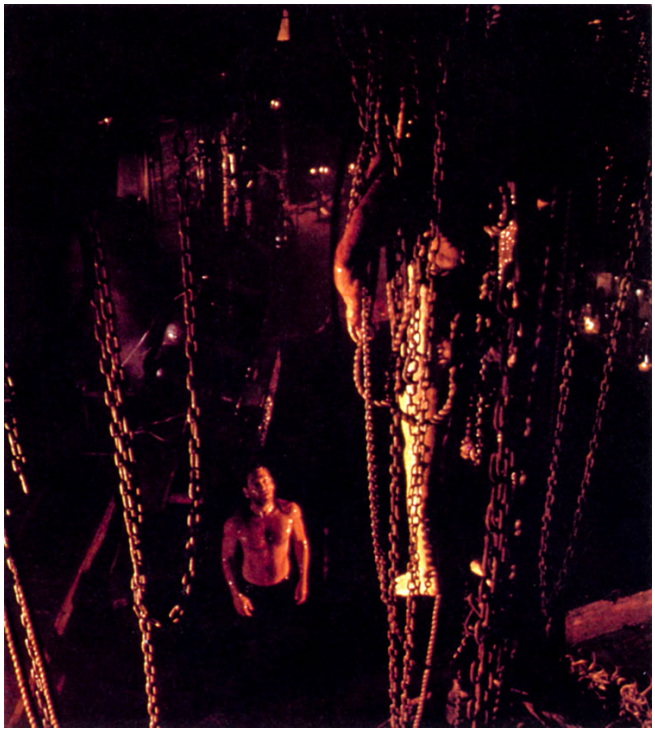
A key element in creating Ingolstadt were real cobblestone streets. Three boatloads of cobblestones were imported from Portugal and split in half to maximize the material. Although impressively authentic, the uneven street surface proved problematic for one scene, a dolly shot that followed *Frankenstein* across the village square and into his lodgings. Instead of the camera being set up on a track, a crane was wheeled across the cobblestones to create a bouncy sensation – but the footage had a little more bounce than desired. "The shot was unacceptably bumpy," said Chris Watts, "so we smoothed it out using motion tracking software. With motion tracking, it is possible to remove even serious lurches from the camera move, even on shots with an overriding tilt or pan. The designer picks points in the scene that the computer can track, and gets values for the motion of those points throughout the shot. The computer determines the offset that would be necessary to keep those points static, and then adds back the values for the overriding move. The secret is to leave a little bounce in the shot to make these distortions seem more natural."

Branagh wanted the camera not only to cross the cobblestone square, but also follow *Frankenstein* up a staircase to his laboratory dwelling in a single uninterrupted take. The physical logistics of the camera work, however, dictated that the action be captured in two separate cuts. Since CFC was already doing image processing on the first part, the unit offered to digitally incorporate the second into one seamless shot. "The first part of the dolly shot followed *Frankenstein* across the cobblestones of the square to the top of his staircase," said Watts. "Then the camera passes him for an instant, and the next cut picks up with him walking into his doorway. Originally they had tried to do the shot as an optical dissolve – which did not fool anybody. What Chris Panton did was to line up the two segments to establish realistic timing. He then used the leading edge of Victor's jacket to wipe the frame, hiding the old background and allowing the new background to take over as Victor exited frame."

The centerpiece of Mary Shelley's *Frankenstein* – as with previous film versions – is the sequence in which Victor's creation is brought to life. The 1931 *Frankenstein*'s most memorable scene features the inanimate creature being raised up to the skylight to receive the cosmic charge of a nocturnal electrical storm, while in the lab below, dynamos and Tesla coils pulse and spark. Although the power of that imagery has not waned in the six decades since, the scene bears absolutely no resemblance to Mary Shelley's account of the fateful night *Frankenstein*'s creature is brought to life. In her work, *Frankenstein* has not only engorged his mind on all that the natural sciences have to offer, but draws for inspiration on his interest in the occult. At Ingolstadt he haunts burial vaults, studying the course of death and decay. From dissecting rooms and slaughterhouses he assembles the flesh, from charnel houses the bones, that form the lifeless clay of his creation.

Finally, at an hour past midnight on one wintry night, with rain pelting the window pane of his lab

Cast in the role of the creature was Robert De Niro. Full-body prosthetics – sculpted over a lifecast of the actor – covered nearly every inch of his body for shots in which the creature, newly animated, clings naked to his maker in a pool of amniotic fluid. Experimenting with a variety of materials and techniques, Parker used foam of varying densities to manufacture prosthetics that would accurately simulate real skin and musculature.



and working by the dying light of a single, flickering candle, *Frankenstein* brings his creature to life. No mention is made of electricity – although Shelley earlier describes the doctor's ruminations on the natural power of electrical storms – or the means by which the creature is animated. "Mary Shelley gives a tremendous buildup to *Frankenstein*'s state of mind," Harvey noted, "but skirts around the whole subject of the creation. Clearly, she wasn't interested in how it was done – although that became a focal point of succeeding films."

Repulsed by his makeup for the creature, Frankenstein in eight distinct pieces, but the lab full and requiring several days' work just to insert the thousands of strands of human hair.

Branagh, too, saw the sequence as a pivotal moment for his film. "It is the scene that gives the film its visceral quality. We wanted Victor to be so frenzied, so caught up in the moment, that his energy and excitement blind him to the fact of what he is doing; so that it then becomes a tremendous shock to him when the creature actually emerges." The methodology of creation is strikingly different from previous movie versions, with the inanimate creature placed in a heated copper sarcophagus filled with amniotic fluid and connected to a pulsing sack of electric eels that sting and spark life into it. "There's a logic to the creation," observed Harvey, "which I hope does not come over as being prosaically logical. It has the power of sorcery and voodoo – a thread that runs through a good early quarter of the film with *Frankenstein* wanting to know all about alchemy and the occult as well as modern science – but there is also logic and science behind it."

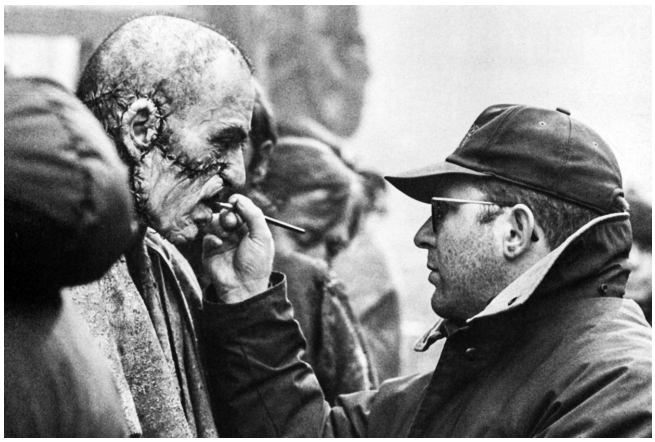
Richard Conway and his physical effects team provided the workings of the laboratory. In keeping with the time frame of the novel, the lab was designed with a very low technology, using the earliest forms of scientific paraphernalia, galvanic batteries and electrical generators. "We had to invent all the visual mechanics for the sequence," Conway noted. "There are all kinds of hydraulics and cables, electric motors and steam-driven items. The sarcophagus had a human shape to it, with visual links to a Jules Verne submarine with portholes and lots of rivets. An amniotic sac full of electric eels travels into the sarcophagus along a long tube that *Frankenstein* inserts into the top – the sexual reference is not exactly subtle. The eels were four-foot-long animatronics that we animated with cables and levers on little tracks. When the eels are diving inside, there is all this activity attacking and biting and shocking the creature to life. What Ken wanted was mania, as if *Frankenstein* has really gone mad."

Shooting the elaborate sequence took approximately two weeks and required considerable planning. "We used a lot of camera cranes and cameras on tracks and wires," explained Branagh. "It was a pretty unwieldy set to work in because it was so massive and solid – with lots of big girders and cumbersome equipment. So to do anything – to move or change camera angles – was never just a question of lifting a camera and moving it. You had to really know what you were looking at. Consequently, there was a lot of technology that I had to familiarize myself with. But everything came together like clockwork. Of all the sequences in the film, the creation is the one that most closely follows my original thoughts about it. It was really the central defining scene."

Adding to the intensity of the scene were electrical sparks produced both digitally and as practical background effects. "There's quite a bit of electricity in this film," observed Watts. "We added hand-drawn, animated lightning in the opening sequence of the boat on the ocean; there's a picnic sequence where Victor discovers that electricity can have an animating power; and there are the creation sequences where electricity is everywhere. The practical sparks that were created on the

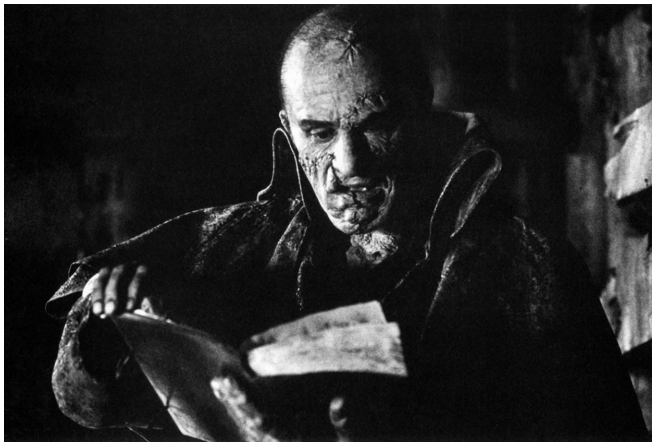
laboratory set were generated by a one-million-volt Tesla coil, a machine that makes big lightning-bolt sparks which would kill without question if they were to hit you. So in some of the live-action scenes they shot a few practical sparks in the far background. We took separately filmed elements of the big sparks generated between two electrodes on the Tesla coil and tracked those into background plates."

CFC manipulated the spark elements digitally, creating a gallery of looks, from arcing bolts to fuzzy emanations. The electrical effects were also created with performance characteristics in mind. "Initially there was a lot of going back and forth because we didn't know whether the sparks were to be friendly or malevolent," Watts remarked. "For the picnic sequence, there was this desire to make the sparks appear sort of friendly and cute – and then make them sinister in the creation sequence. At the end, the production decided that all the sparks had to be malevolent looking."



Robert De Niro receives an on – set touchup from Daniel Parker – a frequent necessity on the especially rigorous Frankenstein shoot which often exceeded fourteen hours a day. Most prosthetics – worn only once – are good for only about eight hours. Particularly vulnerable were lip pieces that went inside the mouth and were prone to dropping off.

There were so many electrical effects – from lightning bolts to the high-voltage sparks in *Frankenstein*'s lab – that CFC designer Val Wardlow wrote special software to enable the digital animators to plot and animate them. "The software defined a curved path which defined the shape of the spark element," Watts explained. "It allowed the designers to animate a stick-figure path for each frame. The software was key to getting the shots out because there were some scenes with as many as two hundred sparks. Once the paths were tracked, we could select from a gallery of sparks, picking the most appropriate sized and shaped spark, and composite it into the frame along that path. The shots varied from tight to very wide. In one wide shot, Ken Branagh was standing on the sarcophagus in the center of the room. In the original footage, there was one weedy spark at the back of the room. When designer Paddy Eason was finished with it, there were almost two hundred sparks, each individually tracked and composited."



Discovering Frankenstein's scientific journal in a pocket of a cape he has stolen from the laboratory, the creature learns of his ghastly origins. Even with the bulky cloak masking much of his form, De Niro routinely wore several body prosthetics, including an oversize hand and a partial chest piece.

For shots of the lifeless creature in the midst of the electrical melee, makeup and prosthetics designer Daniel Parker and his Animated Extras company – based on the Shepperton lot – created an articulated dummy derived from a full-body lifecast taken of Robert De Niro. "Underneath the foam latex skin was an articulated fiberglass skeleton," stated Parker, "with foam padding, bean

bags and mechanics to create realistic body movement. The dummy was a very sophisticated prop, and was employed in scenes where it would have been pointless to use De Niro or anyone else, such as when the creature is lifeless on the platform or lowered into the sarcophagus."

Parker was also responsible for the essential makeup that would transform De Niro into a creature of far greater complexity than previously portrayed on the screen. While the physical horror of its appearance would be retained, Mary Shelley's *Frankenstein* would reveal a being with both a passion for the beauties of nature and a hungry and philosophical mind. "I wanted a creature that was much nearer to what Mary Shelley envisaged than the previous film versions," Branagh noted. "He had to be hideous, but also tremendously sympathetic because of his terrible plight of being thrown into life and then abandoned. It became obvious that we needed someone who could communicate great compassion and wit and strength, as well as being frightening and sinister. There are few who combine all those extraordinary things as well as Robert De Niro. He is a very complete actor – one who has great economy and a sort of latent power. In very subtle ways, he was able to convey a sense of a burgeoning intelligence, as if we are seeing the creature's education happening before our very eyes."

For Parker – who had created creatures, props and prosthetics for movies as diverse as *Return of the Jedi* and *Little Buddha* – the project was a huge challenge. Although the makeup by Jack Pierce that had transformed Boris Karloff into the ultimate *Frankenstein* monster had endured for six decades as a truly iconic image, the script for Mary Shelley's *Frankenstein* dictated an entirely different approach. The creature is described in the novel as a being of proportioned limbs, yellowish skin pulled taut over muscles and organs, straight black lips, watery eyes and flowing black hair. To create a makeup that satisfied the production – particularly De Niro who would literally have to wear an artificial skin over his entire body for many scenes – Parker and his team moved away from both the particulars of Shelley's story and the look of previous movie incarnations. "The creature design was a very collaborative effort," noted Branagh, "and something we were experimenting with right up to the last minute. We all agreed from the start that we were not interested in recreating Boris Karloff's bolt-necked, flattop look. We wanted something that could be grotesque and striking, yet still allow De Niro to be seen underneath, and enable him to act inside. Together, we came up with the idea of a man put together from different pieces. Since Robert's brief appearance as the man who kills *Frankenstein*'s mentor would essentially establish the body around which we built the creature, we gave him a wooden leg and made him rather diseased. Then, working on the principle of a patchwork man, we came up with a list of four or five things we wanted to replace – like exchanging one leg for a bigger one, replacing a diseased arm, putting in a new eye of a different color. There were a lot of discussions about the technical aspects of stitching the pieces back together – how it would have been done rapidly and rather savagely, in a somewhat butchered fashion. The whole process was like a detective hunt through the reality of what might occur – with the result being an 'accident-victim-meets-convict' kind of look that everyone finally agreed upon."

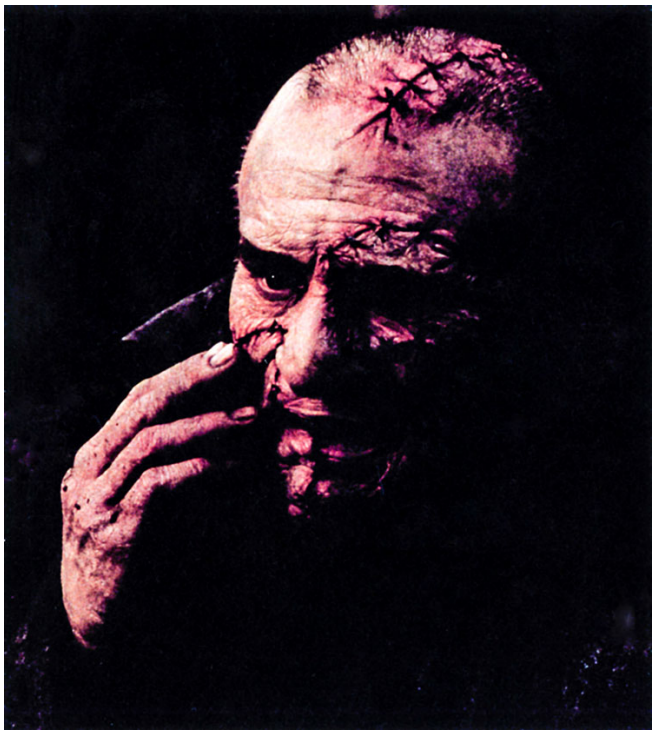
The fourteen-month endeavor began somewhat slowly with months of research, as Daniel Parker and his crew delved into the secrets of how a fictional Dr. *Frankenstein* of the period might actually have sewn together flesh to form his creature. To design a makeup that would have cuts and scar tissue correct for Shelley's day, the unit pored over mortician's manuals and old medical tomes explaining period surgery, the art of dissection, the treatment of wounds, even accounts of primitive

plastic surgery. The group visited medical establishments such as the Royal College of Surgeons for further explorations into the art of suturing flesh, and practiced by stitching up butcher-bought pieces of pork and chicken.

After months of drawing and crafting maquettes, Parker and Branagh flew to New York to consult with De Niro, bringing with them a lifesize prototype head. With the actor's blessing, Parker continued to refine the creature's appearance with sculptures. The final design was a creature made up of mismatched body parts. "Since the idea was that the creature would be a man made up of other men," Parker explained, "there was a left arm that was longer than the right, a longer right leg and a new left eye." Cuts and stitches for the different body parts were all based on the surgical logic of the period. "There were standard mortician's cuts down the middle of the torso to the abdomen, a scar running down the spine where *Frankenstein* had adjusted the creature's spinal column, Y-shaped cuts and stitches around the neck, and incisions in the scalp where the head had been opened for the new brain. There was also a scar that went through the mouth – giving him a distorted upper lip – and stitches on his gums."

De Niro finally traveled to London so that a cast of his entire body could be taken. Working from that lifecast, Parker's team devised several stages of makeup to reflect changes in the creature's appearance that would naturally occur over time as his surgical wounds and sutures healed into keloidal scarring. "Stage One was for his birth," stated Parker, "and within that stage there were several levels. There was a slow changing of color, some of the wounds closing up a bit, a gradual disappearing of the raw redness, and the stitches slowly coming out. Stage Two was similar to the final phase of Stage One, only more so. And Stage Three was the last makeup in the film, where he is basically healed, but still has scars."

All of the makeup stages required a number of prosthetic head pieces, including an eye piece to make one eye look misshapen, separate lower and upper lip pieces, a nose piece and a main head piece that covered the forehead and went around De Niro's head to cover either side of his neck. "There was also a central neck piece that came up and covered the cheeks," Parker elaborated, "as well as two different chest pieces: a small one that we applied most days and a larger one for when more of him had to be seen." The Stage Three makeup consisted of one less head piece, since the eyelid prosthetic intended to make the actor's eye look more closed and deformed was not utilized in later scenes. "By the time he is in Stage Three, the eyes are looking more or less the same size."



Three stages of prosthetics, each having several substages, were devised to represent subtle changes in the creature's appearance as his surgical wounds healed over time. The earliest stage makeup – replete with stitches and open wounds – gradually gave way to later stages that were progressively healed, though still characterized by horrible scarring.

In an ice cave dwelling in the Alps, the creature confronts his distraught maker with questions and accusations regarding his creation.

Full-body prosthetics were also required since the creature is revealed naked in the birth scenes. Body sections consisted of separate arm, leg and torso pieces, as well as a large hand and foot prosthetics. While a general bulking-up of the actor was achieved primarily through costuming in scenes where the creature was clothed, several prosthetic body pieces were still required. "The creature had to have one oversize hand," Parker noted, "so we made a forearm piece and hand for Bob to wear with his costume. He would also wear all of the head pieces, of course, as well as one of the two chest pieces and the big foot piece. To help his limp along, we put a heel into the oversize foot. With the left arm and the right leg being longer, it put the whole look off balance – the one complemented the other." Ultimately, the makeup was crafted with some seven body pieces and eight head pieces. Each full head would require three to four days just to have the thousands of strands of human hair inserted – a job that fell to Jan Baum. Each set of body prosthetics – with hundreds of stitches to be glued into place – took about three weeks to complete. And since the prosthetics could only be worn once, hundreds of different skin pieces had to be created for the production.

Footage of the outcast creature traversing a glacier above Lake Geneva was shot from a helicopter on location in the Swiss Alps. Digital manipulation was employed by Computer Film Company to remove helicopter tracks from the snow and add a trail of footprints across the snowy expanse.

The creature project was so immense that Parker assembled a crew of seventy artists and technicians, coordinating the work as a departmental effort, with separate teams focusing on such aspects as research, sculpting, mechanicals, painting and foam. "A lot of the crew were people straight out of art college," said Parker. "It would have been impossible to get such a large crew any other way. I trained them right at the beginning to do certain jobs – and they were brilliant. I also worked closely with my partners, Nik Williams and Pauline Fowler. Nik was head of the animatronics department, while Pauline headed up the sculpting. David White was in charge of the R&D work, and Marion Appleton supervised all the finishing."

The ambitious undertaking also provided Parker an opportunity to try out prosthetic effects he had previously only imagined. "It's always difficult to cover an entire body in prosthetics – as opposed to a suit – because they have to look like skin and simulate the movement of muscles and joints." The effort required months of working out ways to transfer movements from De Niro's own musculature to the outside of the prosthetics. "What people have done in the past is just use big lumps of foam latex to suggest muscles – but those don't really move properly. What I wanted to do was actually get a muscle system working underneath the prosthetics. I started off looking at pneumatics and what I call 'hard mechanics.' But it became very complex; and I had to take into account the fact that De Niro was going to be falling all over the place, and if there was anything hard in there, it could cause injury. So in the end, I went with what I call 'soft mechanics.' That consisted of different muscle shapes that were put on top of Bob's own muscles. They were all made of different density foams, depending on how we wanted them to move. Then, over that, we slipped on the prosthetic, which was designed to be very tight in places and looser in others. Because the prosthetic was smooth and these 'muscles' were smooth, they moved against each other very well.

It enabled the prosthetic to actually glide over the muscles, creating what looked like appropriate movement underneath. The concept was terribly simple, but it took ages to work it out."

The other challenge was to make the joints and seams in the prosthetic skin vanish. This was achieved with molds that were one piece on the outside – with collapsible cores – so all the seams were inside the prosthetic skin. "Collapsible molds are not often used because they're a lot of hard work and very complicated to design," noted Parker, "but because I didn't want any seams on the outside of the prosthetics, it was the only way to go. With a collapsible mold, the outside of the mold is all one piece – which means no seams – but on the inside there are all these different pieces. It is like a three-dimensional jigsaw on the inside that bolts or clips together. The first head mold, for example, had something like sixteen pieces on the inside, but it was one piece on the outside."

During production, the Animated Extras shop took on the look of a mad scientist's laboratory. "You'd go into their studio," recalled Branagh, "and there'd be forty Robert De Niros hanging up, and hundreds of casts of feet and hands, head and torso pieces criss-crossed with stitches and scars."

From the early sketching and maquette phase through the sculpting, De Niro provided input on the evolution of the creature's look, living up to his reputation as a perfectionist. The actor's professionalism was also in evidence throughout the filming. "Bob was originally scheduled to do forty-two days of shooting," Parker recalled, "but he said no, he would do it in twenty-one days. So we did long, long days on the set. Sometimes they would film more than fourteen hours. Normally, a prosthetic is at its best up to eight hours maximum – but we were doing these horrendous shoots. Some of the prosthetic pieces, such as lip pieces that went inside his mouth, just loved to drop off; but luckily, Bob was very careful and professional about looking after the makeup."

For creature scenes in which the full-body prosthetics were required, De Niro had to be at the studio and begin the makeup application in the middle of the night. "The first full-body test makeup took nine hours to apply," Parker recalled, "but we got faster and faster, and ended up putting the full body and head on as quickly as six-and-a-half hours, which is phenomenally fast. De Niro had to stand up while the full body was being applied; then he could sit down while we did the head, hands and feet. When I put on my prosthetics, I would tension them in certain places and loosen them in others, stretching the flexible pieces with my hands or tweezers. Most of the detailing, such as the painting and application of the stitches was done beforehand, so the finishing touches took a very short time."

Animated Extras was also responsible for a severed chimpanzee arm featured in the laboratory of Professor Waldman (John Cleese), the university physician who at one time shared Victor's obssession with reanimating dead tissue. To demonstrate his findings, Waldman attaches the severed arm to a galvanic battery and brings it twitching to life. The chimp arm was created as an animatronic device fashioned from foam latex and polyurethane material and covered with yak hair. A system of cables enabled off-camera operators to make the arm move and the simian fingers to open and close into a fist.

Also cable-operated was the toad Victor brings to life in a test of his scientific theories. “I’ve been doing this kind of work for years,” Parker commented, “but when I saw it on film, the toad surprised even me. Nik Williams is a very clever animatronics man; and he came up with a lot of details to make the toad convincing. For instance, when a real toad blinks, its eyes also move in and out of its skull. Nik included that movement in the animatronic toad. All the cables for the toad went through the back of the device and underneath the petri dish it was sitting in.” Although the animatronic toad was capable of a wide range of movement, including kicking its legs, a specialized pneumatic ‘kicking toad’ was built specifically for a shot of the toad breaking the glass petri dish. “I think everyone was concerned about the toad not being able to kick through the breakaway glass. At one point there was a ram built underneath, so that when the toad’s foot struck the glass, it would smash. But as it turned out, neither the ram nor the kicking toad was needed – our fully-articulated version was able to do it all. It had leg movement, eye movement, little finger movement – it was a beautiful piece of work.”

Rejecting the creature’s demand for a mate, Frankenstein marries his lifelong love Elizabeth (Helena Bonham Carter), only to have her snatched from him on their wedding night when the creature appears and takes brutal vengeance by plucking out her heart.

A final image of the grieving creature clinging to his lifeless maker as flames engulf them both was shot on a set representing a barren ice field. With the exception of a few scenes completed on location in the Swiss Alps, and some miniature work shot at sea off the Welsh coast, the entire production was filmed in England on the soundstages and backlots of Shepperton Studios.

Additional tasks included the autopsy subject scrutinized by Victor’s university class and a number of cholera victims for scenes revealing the city of Ingolstadt ravaged by the disease. “The autopsy victim was fun to do,” Parker related. “We found a really skinny chap, did a lifecast of him, and then ripped the lifecast to pieces. With the aid of anatomy books we built all his insides. It was actually never meant to be seen as closely as it is in the film; but, fortunately, we had paid a lot of attention to detail.” While makeups on the extras playing cholera victims fell to key makeup artist Paul Engelen, Animated Extras constructed thirty-five fully armatured dummies for scenes showing corpses stacked on carts or lying on city streets.

Perhaps the most startling of all the makeups is the one created for Elizabeth, Victor’s lifelong love. In the film, as in Shelley’s novel, the lonely creature – abandoned by *Frankenstein* and spurned by all – promises his creator that he will disappear into the wilderness if the doctor will provide him with a mate. In the film, the reluctant *Frankenstein* reassembles his laboratory at the family estate in Geneva and sets about to create a female companion for his creature. When the creature presents him with a body to reanimate – that of a family friend lynched for a murder the creature himself

has committed – *Frankenstein* refuses to proceed, fleeing to supposed safety with Elizabeth, whom he has just that day married. Trailing the newlyweds, the creature murders Elizabeth, literally ripping out her heart. In a startling twist from the novel, the bereaved and half-mad *Frankenstein* remakes his young wife, grafting her head onto the torso of the hapless lynching victim.

For the female creature, Parker and his Animated Extras crew took a lifecast of actress Helena Bonham Carter and created another dummy for use in scenes in which Elizabeth's reconstructed body is lowered into the sarcophagus. Carter's makeup, revealed in subsequent scenes, was comparatively simple, as all the research had been done in developing De Niro's. The makeup featured scarring and stitching around a new right hand, prosthetic upper and lower neck pieces, a swollen and blackened eye, and a head half-shorn of hair and riddled with scars and sores. "Ken Branagh had a lot of input in the Elizabeth makeup," Parker recalled. "He wanted to go all the way with it. The whole thing was very carefully thought out so we could produce this really horrendous, shocking effect. The justification for it was that she falls on a lamp when she is killed, slashing her face and burning her head."

In a climactic scene, the reanimated Elizabeth, driven mad by her gruesome plight, commits suicide in the *Frankenstein* home by smashing a kerosene lamp over her head, setting herself aflame, and leaping off a balcony to a conflagrant end. For Richard Conway, it was one of the most difficult practical effects scenes in the film, requiring not only a stuntwoman set aflame, but also the igniting of a draperied corridor as she runs past. "The work with the stunt lady was pretty hairy stuff," Conway admitted. "We set fire to her and she had to run down an eighty-foot corridor, holding her breath all the while because there wasn't room for an air tank in her costume. We also had little mortars – like squibs – drilled into the side of the corridor which we triggered from a board as she ran past."

Silicone fire masks designed to resemble Carter in makeup were built by Animated Extras and worn by the stunt performer. "The usual problem with fire masks is that they are thick," related Parker, "so to get them to actually look like a particular actor or actress is very difficult. Of course, their primary function is to protect the stunt people, so aesthetics are only a secondary consideration. We did a lot of research and playing around with the thicknesses of silicone in order to get it as thin as we could. Underneath, we had to incorporate an asbestos mask and goggles to protect the stunt person as much as possible. Still, we tried to keep everything minimal – these masks were remarkably thin, and worked very well."

Other shots in the sequence were achieved by photographing Carter, in makeup, against bluescreen, then digitally grafting her face to a robotic figure. "The production built a faceless animatronic Elizabeth that had hydraulic arms," stated Chris Watts. "That was used for the scene of her smashing the lamp over her head. Then Mark Nielmes digitally tracked in the bluescreen element of Helena's face and put it underneath the fire. Originally it was a locked-off shot but it didn't cut that well, so Mark also put a camera move on the entire scene."

Computer Film Company also manipulated a shot at the end of the sequence in which *Frankenstein*'s mansion, fully aflame after Elizabeth's fiery suicide, explodes. "The explosion was done at Shepperton as a scaled set piece," Watts recalled. "But for some reason, the windows of the house exploded in a sequence rather than at the same time, as they were supposed to. So designer Paddy

Eason took one window at a time and laid each one over the image of the house, sliding them forward in time so they all went bang at once. When coupled with an appropriate sound effect, the shot was quite convincing."

Footage from the location shoot in the Alps, in which the creature is seen trudging up a snowy peak, also required digital touch-up. "A film crew shot De Niro's double from a helicopter," Watts noted, "but initially it looked fake because you could see the footprints where the helicopter had landed to let him off and he had begun walking. The helicopter had risen up and shot this big, beautiful vista, but you could clearly see that the creature's footprints only extended a few feet behind him. So Mark Nelmes scanned in the footage and digitally erased the helicopter tracks using patches of snow from adjacent sections. He also copied the existing footprints and created a long new line of prints that he tracked throughout the shot."

In her autobiographical writings, Mary Shelley would recall the waking dream that became *Frankenstein* in all its disorienting terror and vividness: "Swift as light and as cheering was the idea that broke in upon me. 'I have found it! What terrified me will terrify others, and I need only describe the spectre which had haunted my midnight pillow!'"

Mary Shelley did more than 'describe the spectre' and share a story with her readers. Somehow she produced a work that burrowed deep into the collective psyche, creating an enduring archetype of horror. Little could she have conceived that her fiction would reach out nearly two hundred years later to resonate even more profoundly for a society grappling with similarly troubling themes. "The moral questions raised by Mary Shelley's story will probably never be more pertinent than they are today," Kenneth Branagh concluded. "Perhaps that's what makes *Frankenstein* so utterly contemporary and frightening in a way that it never was before. Can you imagine how thrilling it must be for genetic scientists today to be on the brink of actually creating life, perhaps even life that has no built-in obsolescence? But as a cautionary tale, *Frankenstein* is saying, 'When you do these things without understanding the consequences, they often end tragically.' And even though that's never stopped us in the past – look at the atom bomb – I suppose somewhere in our consciousness, we like to think that if we keep hearing tales like this, there will at least be a sort of common sense influence to keep us from going too far."

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MAKING GUMP HAPPEN

image

article by
Janine Pourroy

Forrest Gump is a gentle young man making his way with straightforward grace through some of the most turbulent times in American history. Undaunted by a modest IQ and childhood disability, he lives a remarkable life blessed by the clear-sighted determination he gained from his mother and the whimsical good fortune that seems to follow him wherever he goes. These attributes help Forrest become, at various times, a football star, a Vietnam war hero, a champion ping-pong player and a millionaire entrepreneur. On his meandering life course, he finds himself in the company of such historic icons as George Wallace, John F. Kennedy, Lyndon B. Johnson, Richard M. Nixon and John Lennon, as he himself becomes an integral part of the American consciousness. Forrest's poignant – often humorous – narrative is underscored by the bittersweet, lifelong love he bears for his childhood friend, Jenny Curran, whose clouded path serves as a dark counterpoint to his more ingenuous one.

Uncommonly sweet and poignant Forrest Gump was the most unlikely boxoffice hit of the summer. While more a cultural memoir than an effects extravaganza, the Paramount Pictures release nonetheless featured an array of cinematic illusions meant to lend realism to its fond re-creation of thirty years of recent history. Director Robert Zemeckis and actor Tom Hanks confer on the bus stop bench from which Forrest Gump – an intellectually disadvantaged, but spiritually gifted man – recounts his life story.

Forrest Gump was directed by Robert Zemeckis, whose skill at marrying incredible storylines with flawless visual effects is evidenced by such films as *Who Framed Roger Rabbit*, *Death Becomes Her* and the *Back to the Future* trilogy. The Paramount Pictures release – starring Tom Hanks in the title role, with Robin Wright as Jenny – was written by Eric Roth and based on the novel by Winston Groom. Zemeckis was first introduced to *Forrest Gump* early in 1993 when he was given Roth's screenplay. He was immediately intrigued. "I found the story very compelling. I wanted to know what was going to happen to this character, and I just kept reading it. I was fascinated by the fact that there weren't any

Aiding Zemeckis in bringing the project to fruition were his frequent collaborators at Industrial Light & Magic. A variety of scenes placing Forrest into historical situations involved the compositing of bluescreen elements of Hanks with actual archival footage. Early in the film, at the

conventional storytelling devices in the screenplay, and yet I kept turning pages wanting to find out where it was taking me."

University of Alabama, Forrest is witness to Governor George Wallace's defiance of federal integration laws.

The challenge of realizing Forrest's unconventional story – which included several convincing meetings with presidents and his happenstance presence at some of the most pivotal and vivid moments in our history – took Zemeckis to longtime visual effects collaborator Ken Ralston of Industrial Light & Magic. Ralston's history with the director had begun in 1985 with *Back to the Future* and continued through *Who Framed Roger Rabbit* and *Death Becomes Her*, the latter two efforts earning him Academy Awards. "I had the same experience as Bob Zemeckis when I read the script," recalled Ralston. "I kept wanting to turn the page to see what was going to happen next to this guy. It was fascinating – and in some ways it seemed like a huge gamble. From the start, we knew this film could be horribly misunderstood and end up a noble experiment. It could have been Gomer Pyle if Tom Hanks had not approached it correctly."

Ralston approached his own tasking by going through the script and determining which shots ILM would most likely be called upon to accomplish. Although *Forrest Gump* was not a typical 'effects film,' it would clearly require some sophisticated computer graphics to create the reality Zemeckis was seeking. "There were some shots that were immediately obvious," stated Ralston, "like the archival sequences where we had to place Forrest in historical footage with George Wallace and John F. Kennedy. We also knew we would be making the Lieutenant Dan character into a double amputee. But there were other shots that evolved along the way."

A series of preproduction meetings began in June 1993. "We'd go into these meetings," Ralston recollected, "and Bob would walk the various department supervisors through the script. It was great to watch the faces of the newcomers who hadn't worked with him before, as the show escalated rapidly while he was just talking about it – and their jobs suddenly got a hundred times harder." Conceptual designs for the film were also worked out during these meetings. "At the beginning," recalled ILM visual effects producer Debbie Denise, "we were trying to flesh out exactly what Bob saw for the movie. For example, when Forrest first meets Jenny he says she looks just like an angel. Initially we wondered: 'Well, should she really look like an angel? Or should that be interpreted metaphorically?' Gradually we moved away from a fantasy-like interpretation of the script and made it less of a cartoon. Eventually, most of the effects were part of the realism of the film."

Forrest has his first brush with fame when he makes friends with a young Elvis Presley. The future rock star's famous pelvis-pivoting moves are – as it turns out – inspired by Forrest who, as a boy, dances in leg braces while Elvis is a guest at Mrs. Gump's boarding house. Compared to those that would follow, the scene was achieved simply enough with an actor playing Elvis (Peter Dobson) photographed together with a young Forrest (Michael Humphreys). While the same approach might have worked throughout the film – employing a bevy of Wallace, Kennedy, Johnson, Nixon and Lennon impersonators to perform opposite Tom Hanks – Zemeckis chose instead to use state-of-the-art computer graphics to place Forrest alongside the actual historical figures.

Obtaining an abundance of archival footage became an immediate priority. Zemeckis had to find specific footage that would both support the script and work within the computer graphics

parameters set by ILM. He gave postproduction supervisors Steven J. Boyd and Rick Porras the chore of scouring archives across the nation to find out precisely what was available. The pair contacted more than a hundred archives before ultimately whittling their sources down to about ten.

None of the archives was willing to part with original master footage, so Porras and Boyd flew around the country to view it in person. Once their selections were made, video transfers were requested so that Zemeckis could view the material back in Los Angeles. Those segments the director found suitable for his purposes then went to Ken Ralston who analyzed them to determine whether ILM could digitally place Tom Hanks into the footage. "Every possible complication was in those shots," recalled Ralston. "There was outside footage, inside footage, horrible lighting conditions, and it was all shot on 16mm. To make things worse, each cut was from a different piece of film, on a different stock, under different lighting conditions. Some were black-and-white, some were in color. Some of it was handheld, with zooms all over the place. Also, the film wasn't treated very well; so it was pretty scratched in some cases." For the footage finally selected, ILM needed 35mm source material – as only 35mm film could be input into their computer scanners – so the archives were commissioned to supply the best possible blowups from their 16mm originals.

Using the archival footage for reference, Ralston oversaw the filming of Tom Hanks against bluescreen. Those bluescreen elements would then be combined with the archival footage to create the new scenes called for in the script. In setting up each bluescreen shot, the height of the original photographer and his distance from the subject were duplicated so that the composite would be properly aligned. "We kept the camera locked off when we were shooting the Tom Hanks bluescreen elements," said computer graphics supervisor George Murphy, "with the intent of adding motion later at ILM. We also decided to shoot him in color so that we would have the freedom to make the black-and-white image look like whatever we wanted. Because there was such a zoom ratio – which meant we would really have to blow up Tom's image – we shot Vistavision on its side so Tom would fill the frame as much as possible and so we could get our Vistavision film grain as negligible as we could. That way, when we added grain, we wouldn't have any of our color footage interfering with the texturization."

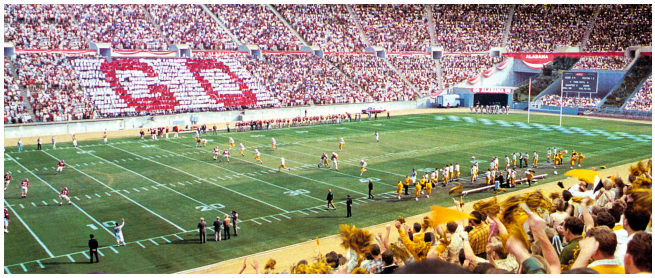
After completing the bluescreen photography, ILM digitally removed the original camera moves from the archival footage so that work could begin to draw the articulate mattes required to place Tom Hanks behind other people in the shots. The mattes were done on the computer using Parallax Matador software which allowed artists to draw outlines that were like rubber band shapes they could adjust to match the changing outline of the subject. This they could do on key positions and then let the computer do the in-betweening. The technique gave the artists a much higher level of precision than would have been possible if they were drawing every frame from scratch. "Sometimes, if there was a lot of motion, they still ended up having to do every frame by hand," said Murphy, "but the computer helped us smooth it out as much as possible. We wanted to avoid reading any of the edges as animated matte lines, which would have made it clear that the shot was a composite, a fake. So all the lines had to be very clean, very accurate. I think the roto work in *Forrest Gump* was some of the hardest we've attempted at ILM. We spent weeks refining it on some shots to get it just right."

In the film, the first archival composite occurs between Forrest and George Wallace, when the governor decides to make good on his vow to 'stand in the schoolhouse door' at the University of

Alabama as several black students become the first to integrate its hallowed halls. Forrest had made his way into college by dint of his superior running ability and a football scholarship, and was thus a first-hand witness to the scene. “In the Wallace sequence, we had to shoot Tom Hanks – and an FBI agent standing next to him – against bluescreen and composite them into the scene,” explained Murphy. “I supervised the shot, working closely with roto artists Julie Neary and Sandy Houston, and with technical director Greg Maloney. The difficult thing about this shot – really all the CG archival shots – was that it was so long. We had to maintain the illusion for nearly eight hundred frames, so it had to be done really well.”

To properly position Hanks and the FBI agent into the scene the computer graphics team had to compensate for extreme camera moves in the archival footage. “There were a lot of things going on in the original footage,” Murphy observed. “The camera started with a tight shot of Wallace and panned over to reveal a general and some aides standing on the side. It then pulled back to a wide shot, which included everybody. It was all done with a 16mm camera sitting on someone’s shoulder – just wild news footage with snap zooms and lots of bobble and shake. We had to deal with matching and locking Tom into that shot exactly, without any information about what really happened technically in the original photography. We were just looking and guessing.” To facilitate the matting process, all of the original camera motion had to be isolated and removed. “We took out all of the zoom and shake, thereby creating an essentially locked-down shot. Then we could draw our mattes to a stable image. We could also position Tom Hanks and our agent into the shot and then invert the stabilization. So the same move that we used to stabilize the original footage, we just inverted for the bluescreen footage and added that motion to the two actors.”

Scenes of Forrest running for his college football team employed crowd replication techniques. Live-action plates for establishing shots – filmed at a small, single-tiered stadium in Los Angeles – featured only a minimal number of extras.



In postproduction, ILM extended the size of the stadium, adding a second and third tier, and magnified the number of spectators by filling in the stands with digital duplications of the original crowd.

While shooting Tom Hanks against bluescreen for the Wallace sequence, every effort was made to match the lighting of the original photography. The color footage then underwent a process of texturing and contrasting to transform it into the black-and-white footage required to match the archival news film. Texturing was achieved through a process of adding noise to the image and then manipulating that noise into clumps of grain that were the right size. Murphy could then adjust the sharpness and softness of the texture, as well as highlights, shadows and mid-tones. “We experimented with different ways of creating the grain textures; it was really a layered process by the time we got through with it. We would take our texturing to a certain level, then mix it back to the original to control the density, size and sharpness of the grain. After working out the texturing,

we still had to add an overriding camera move, in some cases, that would allow us the framing we needed to suit our narrow aspect ratio for the final film. In other scenes, we completely eliminated the original camera moves so that we could frame to suit the new action in our composite scene." Actual compositing of the Wallace shot elements was done using ILM proprietary compositing software, as well as Parallax for paint touchup. "To finesse details in our comps, we would just sit down and retouch them. With Parallax, we could do that in an hour as opposed to spending three days figuring out a high-tech solution."

The next key archival scene involves *Forrest Gump* and the All-American Football Team meeting President John F. Kennedy in the Oval Office. Three separate archival sources were used for this sequence. The first was from a film of Kennedy meeting the Penn State football team in the Rose Garden on a cold, cloudy day; the second was of him shaking hands in the Oval Office with a delegation of Peace Corps volunteers; and the third was from an official meeting the president had with a group of Boy Scouts. For this sequence, rather than inserting Tom Hanks' bluescreen image directly into the archival footage, both Kennedy and Hanks – along with other actors in the scene – were lifted and placed into background plates of an Oval Office set that had been filmed during principal photography in Los Angeles.

Because Forrest was required to actually shake Kennedy's hand during the scene, Hanks was photographed against bluescreen using little white reference markers, either hanging on monofilament lines or mounted on stands, to guide him in the performance of the handshake. Audio cues further helped the actor match his timing to the reference footage. A monitor was placed on set for Hanks to consult, but he generally found it a distraction. "Tom modestly downplayed his own performance value when we shot the bluescreen work," recalled Murphy. "He kidded that we could just as easily take a guy on strings like a puppet and do this sort of stuff. But we would work all day with a stand-in to rough things out on the set – and he would be nowhere near the mark compared to Tom. In two takes, Tom would be right on it."

Throughout the film, Hanks consistently rose to the challenge of acting opposite invisible partners in unlikely situations. "It all starts with who you cast," commented Zemeckis. "These kinds of illusions only work if the actor makes them work. You can have the most beautiful effects possible; but if the actor isn't believing it, or if the actor isn't making eye contact with the creature or the cartoon or whatever, none of it will ring true. The actor is crucial – yet the actor often feels more like a prop than a performer. It's hard for them, because on the set there are all these technicians worrying about things that have nothing to do with their performance. They have to go through it so many times, and it's so mechanical and tedious; but in the end, they have to make it work. It's important to cast people who aren't going to chafe under this crush of technology. Tom was really tremendous in this capacity."

In digital postproduction, the Gump-Kennedy handshake was finessed by using morphing tools to reposition Hanks' arm and hand to achieve a more perfect fit. The areas requiring repositioning were selected on the computer and assigned new positions. The computer then choreographed the in-between motion, making the movement flow smoothly. "While Tom's timing was close, we never expected it to match exactly," explained Murphy, "so we still had to reanimate his hand to match Kennedy's handshake more closely. Then painter Kerry Nordquist went in by hand and made the

smaller adjustments. For instance, Tom's thumb was pointed up; so we had to paint it back down and wrap it around. When you see the handshake in motion, it works really well."

Unlike the earlier sequence with George Wallace, where Forrest was more or less an observer, in this sequence he actually has a verbal encounter with John Kennedy. At a reception prior to the ceremony, Forrest discovers that he can have all the 'free' bottles of Dr. Pepper he can drink. Unfortunately his indulgence catches up with him just as it is his turn to shake Kennedy's hand, and he informs the surprised president that he's 'got to pee.' Kennedy responds with good humor and turns away from Forrest, remarking to an aide, 'I believe he said he has to go pee.' Archival footage for this part of the sequence was culled from the Peace Corps delegation's visit to the White House, while the image of Kennedy turning around came from his meeting with the Boy Scouts of America.

Honored as a member of the All-American Football Team, Forrest shakes the hand of President John F. Kennedy at a White House reception.

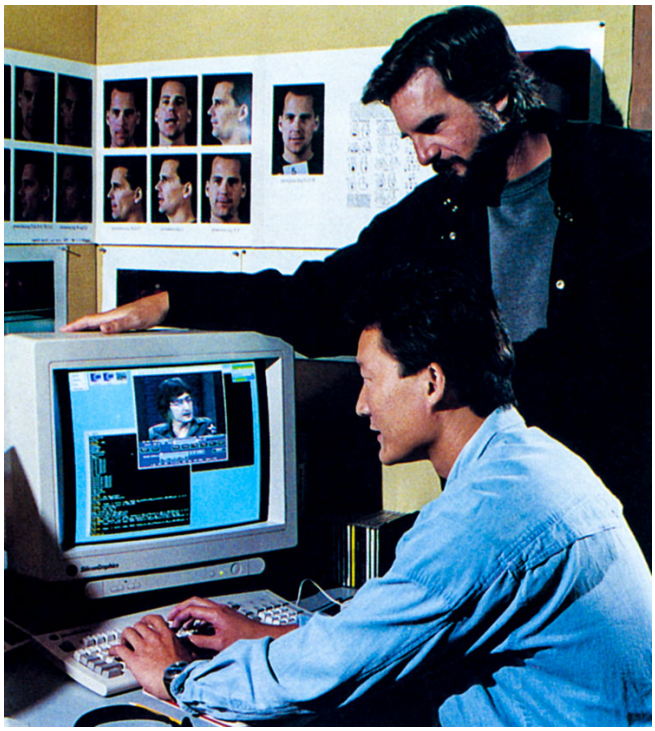
To incorporate Hanks with imagery of the late president a replica of the Oval Office was constructed on stage.

The business of putting words into Kennedy's mouth was achieved by visual effects art director Doug Chiang using a morphing technique. "At first we didn't really have a technique nailed down for the morphs," Chiang remarked. "We weren't even sure there were going to be any morphs. On location, they had some visual look-alikes, who were also sometimes sound-alikes. We shot footage of them saying the dialogue with the hope that we might be able to use some of their actual mouth work and attach it to the Kennedy footage. But people like Kennedy are so famous that if what you're doing is off even a little, it is really obvious. We ended up just using the actors as a reference so we could see exactly what the characters' mouths should be doing as they spoke."

Chiang broke down the dialogue track from the Kennedy sound-alike frame by frame, observing closely how the actor's mouth was moving as he delivered the lines. He began by working with the overall movement of the face, going in with the morph program to animate the jaw, cheek muscles and other gross facial movement. Finessing the lip positions came next. "The mouth area was difficult

to see because the morph distorted it a lot," commented Chiang. "It was basically just a big blob. There were no teeth or tongue and there was very little information available to base those elements on. We could see how his lips were moving – the speed they were moving and the shapes they were forming – but the actual fine-tuning of all the subtleties of speech was added later with paint. For example, I went through the whole morph and blocked it all in, getting the timings right. Then I went back in and started painting a new mouth that was perfect for the character. I looked at a lot of footage to see how JFK spoke and how exaggerated his lip positions were, and tried to match it. Then I went in and painted new teeth and animated them in the new mouth along with the tongue positions. It went back and forth. I would morph, and then I would paint in new teeth and lips. Then, if I needed to, I would go back and remorph that whole image. The process itself was simple, but it was very time- and labor-intensive, because I was animating it frame by frame."

With digital compositing, Forrest Gump's handshake with President Kennedy was accomplished by painting the arm of actor Tom Hanks over that of Kennedy's aide, Dave Powers. Chiang added motion blur to the arm to align the handshake more precisely during final compositing.



Several scenes required ILM to put words into the mouths of historical figures. Mouth movements were produced through a combination of morph and digital paint techniques. Effects supervisor Ken Ralston observes as visual effects art director Doug Chiang finesses a shot of John Lennon speaking.

Special effects supervisor Allen Hall rigged large-scale explosions to replicate the Vietnam experiences of Forrest – now drafted into the army. A scene of Forrest carrying an injured comrade as fireballs erupt around him was achieved safely through the use of digital compositing. Jet fighters delivering napalm cannisters were computer generated models.

For a scene in which Forrest is persuaded to speak at an anti-war rally in Washington D.C., a crowd of only one thousand extras was multiplied a hundredfold and digitally placed along the Reflecting Pool in front of the Lincoln Memorial. Reflections in the water of the Washington Monument and nearby trees were also added.

Later on in the story, Forrest goes to Vietnam and returns a war hero. He receives the Medal of Honor from President Lyndon B. Johnson in another sequence integrating archival film with contemporary live-action. “The LBJ footage was pretty difficult to work with,” stated Ken Ralston. “It was all over the place. Essentially we had to steady the plates and create new material that locked them off. We ended up with a steady shot of Lyndon, with the frame moving all around him. That initial work was required because we had to do a lot of rotoscoping to take Johnson out of shots that he was in and put him into other shots. We took his head off one shot and put him on the body of a stand-in in another shot. We also put him in backgrounds that we shot on the Oval Office set at Paramount.”

For a scene in which Forrest is persuaded to speak at an anti-war rally in Washington D.C., a crowd of only one thousand extras was multiplied a hundredfold and digitally placed along the Reflecting Pool in front of the Lincoln Memorial. Reflections in the water of the Washington Monument and nearby trees were also added.

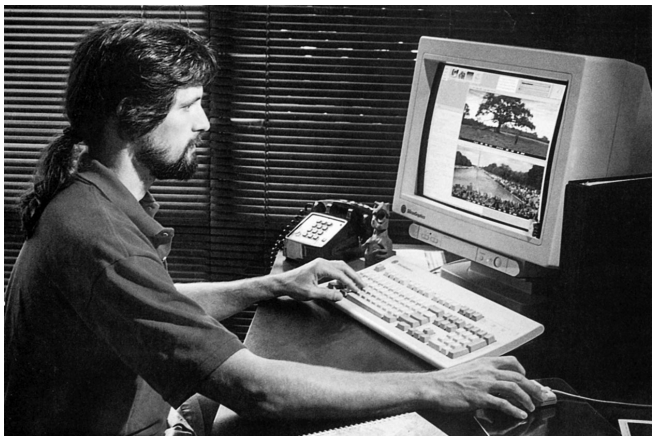
The original archival footage – which was in color – showed Johnson staring straight at the camera without speaking or moving. The problem was that the president needed to respond, “Oh, that must be a sight,” to Forrest’s pronouncement that he had been shot in the buttocks during battle. Chiang knew that creating mouth movement for the scene was only part of the problem; facial expression was also required to convince audiences that Johnson was actually speaking. “I studied the stand-in saying the line and he actually had a lot of head motion,” said Chiang. “His face showed expression; his eyebrows lifted and he blinked. I tried to mimic the stand-in as much as possible to give Johnson character. I put in an extra blink that wasn’t in the original footage; I moved his eyebrows around, gave his jaw and cheek some more life. I also added teeth and all the tongue action for when he opened his mouth. Those things were really important in selling the shot.”

Later, after achieving fame as America’s foremost ping-pong player, Forrest is invited to appear on The Dick Cavett Show where he meets John Lennon. This shot was created by duplicating the show’s early seventies set and filming the present-day Cavett – groomed to look like his younger self – along with Tom Hanks. Cavett and Hanks were then extracted and placed into the original archival footage of a show that had featured John Lennon and Yoko Ono. Cavett was placed where he had originally been while interviewing the couple; Hanks sat in for Yoko. “It was mostly a matter of blending the split lines and matching the video grain and size,” explained Chiang. “I was most pleased with the very last mouth morph on that one, the closeup where Lennon says, ‘It’s easy if you try, Dick.’ I thought it looked very natural. The original I was working from had Lennon doing very subtle jaw movements – but not very many of them – so I didn’t have to take out much. It was basically a matter of enhancing what was already there.”

The third president Forrest meets is Richard M. Nixon, who presents him with a plaque for his participation in the United States ping-pong tournament against China. For this shot, ILM retained the original background in the Nixon archival footage. A man standing in the shot with Nixon was painstakingly painted out, and bluescreen footage of Tom Hanks was composited into his place by technical director Jon Alexander. “The Nixon shot was probably one of the most difficult because it was a long shot,” Chiang commented. “The problem with the shot was that there were only two

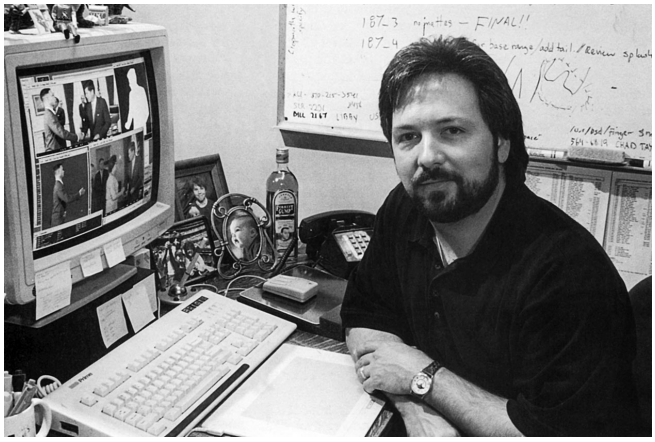
points in the original footage where Nixon actually talked when we wanted him to. The rest of the time we had to either take words out of his mouth or put words into his mouth. That was a difficult process. Nixon also had a tendency to make some strange expressions, which we had to eliminate."

Although the footage depicting *Forrest Gump* alongside historical figures long dead was clearly a contrivance, it was done in as realistic a manner possible. So, too, was the effects work done for the Vietnam War sequence that rendered his commanding officer a double amputee.



Computer graphics supervisor John Schlag – who oversaw most of the crowd replication shots – at work on the peace rally sequence. Lining the pool with thousands of people was especially challenging because there were no clearly defined separation points to aid in joining groups together.

When Forrest joins the army he meets Benjamin Buford Blue (Mykelti Williamson) – better known as Bubba – a kindred spirit who shares with anyone who will listen his dream of becoming a shrimp boat captain. The two forge a bond of friendship, with Forrest promising to one day join Bubba in the shrimping business. Both are shipped off to Vietnam where they serve under the leadership of Lieutenant Dan Taylor (Gary Sinise). A battle soon disrupts the routine of army life with devastating results: Bubba is killed in action, and Forrest and the lieutenant are injured – the latter seriously. Forrest ends up in an army hospital in the bed next to Lieutenant Dan, who lies there in black despondence. The reason becomes clear when it is revealed that the man's lower legs have been amputated. "Bob Zemeckis wanted to avoid the typical gags where Gary would have sat on his legs or had them dropped through the bed somehow," said Stephen Rosenbaum, computer graphics supervisor for the sequence. "He wanted it to be so realistic that people would buy into the reality that this guy had no legs. This he achieved by having Gary swing his severed legs in front of the camera lens in full view of the audience."



Computer graphics supervisor George Murphy pauses during compositing of the Kennedy handshake. In addition to matching the archival action – which was invariably recorded handheld or with unstable cameras – digital artists had to simulate emulsion grain in the archival footage and incorporate it into the more pristine bluescreen photography.

After the initial reveal showing Lieutenant Dan without legs, a hospital orderly comes by and picks him up, then carries him over to a nearby gurney. During the live-action shoot, Sinise was filmed lying in a hospital bed with a hole for his legs that extended out to the side. That way, when he was lifted up, his legs could slide out towards the orderly. ILM then went in and replaced the hole using computer graphics, filling it in with a piece of sheet and blending in the remainder of the bed to make it disappear. The CG team next digitally removed Sinise's legs as he was being lifted out of bed. During the shot, the actor wore stockings made of bluescreen material so that articulated mattes could be extracted from the

footage. “Lisa Drostova drew key frames for rotoscope mattes,” explained Rosenbaum, “just as an animator would key-frame an animation. We then had the computer generate the in-betweens for roto. One of the more difficult parts of that particular shot – and with the entire sequence – was replicating whatever needed to be behind Gary’s legs. When his legs were removed, there was a blank space there – where part of the orderly should have been – so animator Leah Anton had to digitally replicate that part of the orderly and then animate a portion of his side and leg. If anything was moving behind Gary’s legs or there was any kind of camera change, it meant that we had to digitally recreate it. We paid close attention to shadows, too. We had to remove the shadows Gary’s legs were actually casting, and put in the shadows his amputated legs should have been casting onto the bed and the orderly.”

Finishing off Lieutenant Dan’s leg stumps with bandages was another essential part of the effect. “We couldn’t just leave the legs lopped off bluntly,” continued Rosenbaum, “because there would have been a clean line where we took the legs off. So Kerry Nordquist fabricated some knee caps on the computer, and then Peter Daulton did some 2-D animation to make them move.”

Forrest and Lieutenant Dan part company at the hospital. Forrest becomes a world-class ping-pong player and instant celebrity, while the lieutenant ends up an embittered Vietnam vet, life-sentenced to a wheelchair and down on his luck in New York. Forrest happily runs into his former commanding officer on New Year’s Eve, just as he is leaving the Dick Cavett studio. This sequence actually employed a gag wheelchair – designed by Ricky Jay and Michael Webber – that was equipped with a false bottom to conceal Sinise’s lower legs which were tucked underneath him. The same device was used when Forrest pushes Lieutenant Dan across a busy New York street. “The interesting thing about that shot was that it was done at three in the morning in Los Angeles,” noted Rosenbaum. “Eric Chauvin created a digital matte painting of Times Square for the background. He also animated everything right down to the neon signs and moving taxicabs.”

Forrest and Lieutenant Dan end up in the lieutenant’s apartment where two young women have been invited to celebrate the evening with them. One of them disparages Forrest’s intelligence and Lieutenant Dan comes to his friend’s defense. In his anger, he lunges out of his wheelchair and ends up falling face down on the floor. It had originally been planned to have Forrest help him back up. Instead, Gary Sinise lifted himself off the ground and back into the chair. Once again, the actor wore bluescreen stockings and ILM digitally recreated what would have been behind his missing legs – in this instance, the moving wheelchair, parts of his bed and the floor. “That was very difficult,” admitted Rosenbaum. “We had to get the image of a moving wheelchair from somewhere. If, for example, it had been on some type of track, we could have had him do the same motion over and over again – and then maybe we could have done a pass without him. But that was impossible because Bob wanted to allow Gary to move around freely at will. That meant that we had to recreate the wheelchair by cutting and pasting pieces from reference footage, animating those pieces in, and then matching them to the camera motion and Gary’s movements. Kathleen Beeler was primarily responsible for that particular shot, while Carl Frederick handled Gary flipping upright and getting himself back into the wheelchair.”

Forrest leaves Lieutenant Dan and goes to visit Bubba’s family in Bayou Le Batre, Louisiana. There he surprises everyone and buys a shrimp boat for his new company – Bubba Gump Shrimp. After long days of unsuccessful trawling, he returns one afternoon to find Lieutenant Dan waiting for him on

the dock, having unexpectedly decided to take Forrest up on his invitation to join him on the bayou. The lieutenant takes to life on the water, and in one scene ends up perched in the crow's nest atop the main mast – his missing legs clearly in evidence. A subsequent shot shows him lowering himself back down. "That's one of my favorite shots in the whole sequence," stated Rosenbaum. "There's a lot going on. As Lieutenant Dan lowers himself, his bluescreen legs pass in front of the sky. Then they get down a little lower and go over the water – which is moving – then across Tom Hanks and finally the deck. Throughout, the camera pulls back in a very long shot. We had to not only recreate the elements his legs crossed over, we had to animate those elements as the shot progressed."

Technical directors Patrick Myers and Eddie Pasquarello began with shots of Sinise's legs passing over the water, generating mattes which removed the bluescreen portion of the legs. To fill in the resulting hole, neighboring water was patched in and blended, with color and highlights adjusted to match the surroundings. Additionally, Tom Hanks' shoulder and arm – which were obscured momentarily by Sinise's legs as he passed in front of the actor – were recreated and animated by Kerry Nordquist. The shot was further complicated by the long camera pull-back at the end, which caused a perspective change. Recreating part of the boat deck and side rail as the camera moved meant having to recreate every single frame for the length of the pull-back. "It was difficult," noted Rosenbaum, "because we couldn't just cut a piece of boat deck and stick it over the hole where Lieutenant Dan's legs used to be. The perspective was always changing and the grain of that part of the boat was different from the grain of the boat deck somewhere else. To further complicate things, Gary Sinise's real legs were casting shadows everywhere – which we had to remove – and we had to put in shadows for his amputated legs."

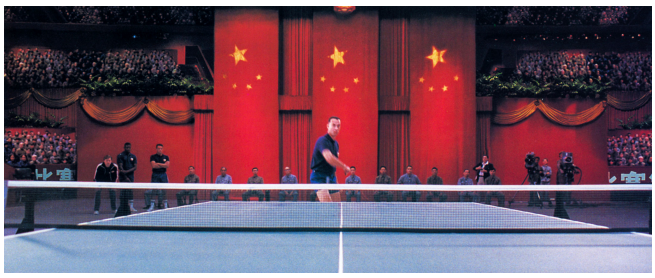
The next shot in this sequence has Lieutenant Dan hopping up on the rail and pushing himself into the water. Rosenbaum handled the forty-eight-element composite that incorporated a variety of articulate mattes, shadow mattes, a rail element, a splash element and a wheelchair element. Background plates of Sinise were shot in South Carolina on the shrimp boat set. A hole was cut in the side rail of the boat for him to slide his legs through. The actor hoisted himself up, shifted his legs through the opening, then turned his back to camera and jumped into the water – actually onto a foam pad floating on the water to avoid having to be dried out between takes.

"Again, Bob wanted to make a point of the audience seeing his stumps," said Rosenbaum. "To do that, we made it look like he swings his legs up in the air, over the water, in clear view. We had to replace the part of the boat rail that had been removed, as well as replicate the part of the water that his legs swing over. We then added the splash – which was a separate element – as a split. It was pretty tricky because there were actually seven splits in that shot as it progressed between the original background and the splash. The problem with the splits was that the different background plates also provided different subtleties – lighting changed, clouds shifted position, water highlights varied considerably at times."

The turnaround for Forrest and Lieutenant Dan as shrimp boat operators comes by way of Hurricane Carmen – another effect contributed by ILM – which destroys most of the local shrimping competition, thereby turning the two friends into millionaires by default. Shots of big waves crashing into their boat were augmented in postproduction, along with torrential rain and the boiling ocean behind the vessel. "There was just an amazing amount of stuff added to that shot," said Ralston. "We shot the crashing waves here in the ILM parking lot one night – big waves crashing into black cycs with big rigs dropping in the water."

Recuperating from a wound sustained in Vietnam, Forrest becomes an expert ping-pong player and ultimately parlays his paddling skill into world renown. In championship competition, Forrest and his Chinese opponent play at superhuman speed achieved by shooting flanks and ping-pong champ Valentino miming an impossibly highspeed volley – without a ball. A computer generated ball was later composited into the scene.

The battle in Vietnam that had so irrevocably altered Lieutenant Dan's fate was orchestrated primarily by special effects supervisor Allen Hall and crew. Hall – a veteran of the pyrointensive Backdraft – staged an explosion using eight hundred gallons of jellied gasoline to simulate a rolling napalm drop that covered several acres. The sequence also included elements contributed by ILM. Two digital matte paintings were generated to enhance the South Carolina island that served as a set for the sequence. The first was a wide vista of grassy fields with a water buffalo and some peasants; the second was a Vietnam mountain background for a scene of soldiers walking along a road. The constant rain that fell throughout much of the sequence was achieved via floor effects and rain machines, while the comically abrupt ending to the four-month-long torrent was assisted by ILM effects personnel who digitally painted out – frame by frame – any stray raindrops that continued to drizzle after the machines were shut down.



Spectators were digitally inserted into the stands – and Chinese flags inadvertently hung upside down in the original photography were inverted to appear correctly.

With fierce determination, Forrest rescues several of his fallen comrades after an explosive barrage transforms the jungle into an inferno. He returns to the heat again and again, finally outrunning a wall of flame after a tree explodes nearby. "It would have been too dangerous to blow up a tree like that right next to the actors," said Ralston, "so we had to create a composite digitally. Bob wanted to play it in one shot. It started with a stuntman carrying another stuntman over his shoulder. He ran up to a certain point and then stumbled with the guy. At that point, we moved Tom Hanks into the shot with Mykelti Williamson on his back supported by a wire rig – this guy was big and Tom simply couldn't run with him. Tom matched the stumble and then kept running right out of the shot. We had to do a morph from the stunt guy to Tom, and remove the wires. Then we added the napalm stuff that Allen had rigged. We shot everything at 72 frames a second. We did a dissolve and some splits so the running could be at one speed while the napalm was at another speed. That made it seem slightly surreal. There was a lot of roto work to put Tom in front of this stuff. Every frame had

to have a complicated matte. Putting him into the shot with the plants and the interactive lighting when the fire got really close made it tough." Added to the shot were three computer generated F-4 Phantoms flying at low altitude that come in and drop five napalm canisters, causing the explosions. Stewart Lew modeled the jets, while computer graphics artist Alex Seiden did the rendering and animation. Painting tasks were performed by Scott Frankel.

The Vietnam sequence also called for tracer fire commonly used in jungle warfare. In order to create a realistic simulation of such fire, ILM engaged military technical advisor Dale Dye, a retired Marine Corps captain who served in Vietnam. "We went out to a firing range and set up a camera at the far end," recalled Stephen Rosenbaum. "Tracer bullets – which might be every fifth or tenth bullet that comes out of a machine gun – have little phosphorous tabs. When the tracers are fired, the phosphorous ignites and produces this orangy-yellow glow – sometimes red, depending on the type of phosphorous. What that does is allow the shooter to see where he's aiming, because sometimes in jungle settings it's difficult to see what you're aiming at. Dale shot right off camera, maybe six inches away, and we captured all this footage of what tracer fire actually looks like. Then we replicated it in the computer. People I've spoken to who were in war situations – Vietnam vets – have said that our work looked exactly right."

Another brief shot using tracer fire included a side view of two machine gun operators trying to set up their weapon when a bomb goes off right underneath them. "We had the live gunners and then we had two dummies with explosives rigged underneath," stated Rosenbaum. "We filmed both from the same angle and transitioned between the live-action people setting up the gun to the dummies being blown to bits, with tracer fire going on all the while."

While recuperating at a veteran's hospital from the injuries he sustained in battle, Forrest discovers a natural aptitude for ping-pong which soon leads him to considerable renown. As a member of the United States table tennis team, he finds himself in world competition against a team from China, playing with a volley speed so phenomenal that the aid of a computer animated ping-pong ball was essential to convey his skill at the table. For the live-action portions of the ping-pong scenes, Tom Hanks worked with a paddle – but no ball – to keep pace with a metronome operated on the set by Ken Ralston. "I kept turning up the metronome and trying to visualize the correct speed," Ralston recalled. "Tom was playing faster than anyone on the set could really play. Getting the animation to look like a ping-pong ball wasn't all that hard – Brian Van't Hul did a really great job using 2-D animation and giving the ball a blur. The tough part was getting Tom's opponent, Valentino – the real champion ping-pong player he was playing against – to match the pace. It was hard for him because he wasn't used to playing without a real ball; it was all fantasy, all miming. He's a great player, but taking the ball away left him stymied. Tom was really good at helping him out and getting back into the rhythm of miming the play."

Sequence supervisor John Schlag was responsible for crowd replication in the Chinese pavilion where vast numbers of spectators had gathered to watch Forrest and his opponent play. Schlag also made certain that the Chinese flags draped in the background – which had inadvertently been hung upside down during live-action photography – were inverted back to their proper position. Technical director Mary McCulloch did the matte painting work required to correct the flags, and also added sections of crowd to the large seating area. Brian Van't Hul's ping-pong ball animation was then composited over the assembled shot.

Presented with a plaque for his victory in the world ping-pong tournament Forrest gets to meet his third U.S. president Richard Nixon.

Other key scenes in the film also featured crowd replication – on an even more elaborate scale. In Washington to receive the Congressional Medal of Honor for his wartime gallantry, Forrest goes sightseeing and is inadvertently shuttled into an enormous anti-war rally at the Lincoln Memorial. The uniformed hero is quickly led on stage to speak about his Vietnam experience in front of a huge crowd lining the Reflecting Pool stretching from the Lincoln Memorial toward the opposing Washington Monument. Only a small fraction of the 100,000 protesters required for the scene were actually on hand. "The crowd sequence in Washington was painful," Ken Ralston admitted. "Unlike the Chinese pavilion shot, we did not have any geometrical shapes to help us blend in crowds. Most of the time I see this trick done is in stands and bleachers, where everything is separated by the physics of the bleacher sections, which makes it easier to matte.

Preparing the archival footage entailed painstakingly painting out a man standing next to the president and replacing him with a bluescreen element of Tom Hanks. Because the archival footage featured Nixon speaking – or not speaking – at moments that were inappropriate for the movie, lip movements and attendant facial expressions had to be either added or removed throughout.

And usually the camera is locked off. This shot had the camera panning all over the place and moving with Tom, and we were dealing with a giant crowd. Also, we shot the scene in late October, and it was bitter cold; so after lunch, half the crowd didn't come back. We only had about a thousand people to work with, and we needed a lot more. The day before we started this shot was the end of daylight savings, so the sun was only up for a small amount of time and we were racing to get the shot done. We also had to share the crowd with first unit, and we couldn't start until they were finished. Luckily, we had done some shooting at the beginning of the day when we had had enough people to get most of it in. We used that same crowd in the foreground for the crowd along the sides – moving it and just plugging it in. The complication was that we had no bluescreen – which meant that we had no way to pull mattes easily – and we needed to get mattes off of all this

minutia such as protest signs and little heads. There was also a strong wind that caused our match-move camera system to be blown around, so the matching moves were never quite exact. As a result, we had to go in and match and steady every single frame. Another consideration was that we wanted reflections of the Washington Monument in the water – but there were no reflections on the day that we shot because it was so windy. So we had to add the reflections of the monument and the trees and the people. In some ways, these were the hardest shots in the whole movie."

The sequence begins with a master background plate of Forrest coming up the stairs and being hustled on stage by Abbie Hoffman – this time a look-alike actor. The camera then pans across a foreground crowd of some four hundred people, then pans again over the rest of the crowd surrounding the Reflecting Pool with the Washington Monument at the far end. Later in the scene, Jenny steps out of the crowd and into the pool, waving to Forrest on stage. "The beginning of that sequence was shot with a motion control camera," explained John Schlag, "so there was a very large camera move we had to follow. Even though motion control gives you a scene which is ninety-five to ninety-nine percent repeatable, there can still be slight mismatches. Also, there were people walking across the platform where the motion control camera was set up – which caused it to jump up and down – and the wind was blowing right into the camera, making it shake. So there were slight imperfections in the match between each of the crowd elements and the master background plate. We had to make garbage mattes and stabilize them to the background plate, as well as color correct them to make sure they matched the lighting in the master plate for each of the crowd elements we put into the scene. We reshot the crowd in a different place each time. Of course, that meant Tom Hanks was in a different place each time, too. Sometimes he was standing over clear green grass; at other times he was standing in front of crowds. We needed a matte to pull him out and drop him back in front again. We also had to pull mattes for the people standing in the foreground of the crowd and on the stage. There were mattes for Tom Hanks and the Abbie Hoffman character who came into the shot with his hair blowing in the breeze. Technical directors Howard Gersh, Bob Patterson, Robert Marinic and Mike Conte spent a lot of time stabilizing elements, color correcting and doing mattes for various objects."

Crowd replication techniques were likewise employed to enhance the football sequences during Forrest's University of Alabama days. "The crowd replication for that sequence was very similar to what was done in the D.C. sequence," observed Schlag. "Mary McCulloch and I composited that one. The principal photography crew had shot the action they wanted on the football field, as well as some people in the audience holding up cards that spelled out 'Go Forrest' and 'Go Alabama.' But they couldn't get the action they wanted on the field and the action they wanted in the stands at the same time. So they did two separate takes and we split them together. Then we had extras filling various parts of the stands whom we replicated to fill the rest of the stadium. Another big thing in that sequence was to make the stadium bigger. The original stadium, which was filmed somewhere in East Los Angeles, was only one tier high. So we had matte painters Eric Chauvin and Bert Monroy design a stadium that we could put the rest of these people into. We started with the one-tier stadium that had the live-action element, then made a second and part of a third floor. For a shot of another game that took place during this sequence, we replicated the crowd and pulled up the stadium as before. But this time, we also made some adjustments to the people along the field

who were wearing school colors – Mary McCulloch pulled them out of the plate of one game, changed the color of their uniforms from yellow to green and dropped them into the scene."

Much of the electronic editing for this and other scenes was done using the Sabre system – a proprietary real-time compositing system developed by ILM. "It's like a post house," explained Schlag, "or a Harry suite, where you go in and sit down in front of a lot of hardware and software support and get realtime feedback. It was extremely helpful. Maybe a third of the composites for the whole show were done through Sabre. We integrated that system into our environment really tightly in order to get Gump done."

After years of chance meetings and all-too-sudden partings, Jenny and Forrest are reunited at home in Greenbow, Alabama. It is a time of healing for the world-weary Jenny and a time of bliss for her devoted friend. Forrest proposes to her, and although she declines, they spend one last night together at the Gump home. Jenny slips away the next morning, leaving Forrest in despair. He takes off running and literally runs from ocean to ocean and back again across a breathtakingly picturesque America – starting, it seems, the running craze that swept the country in the eighties. Surprisingly, the panoramic scenes were not done with matte paintings. "Aside from one augmented shot," Ken Ralston noted, "it was all footage shot during live-action. The one we did modify came at the very end of the show, and we only made the adjustment there because it was very dialogue specific – where Forrest is running past a beautiful lake with a reflection of the sky and he says, 'I ran by lakes that looked like two skies, one on top of the other.' They had shot footage at a lake in Colorado – but it was on a really windy day, so the surface of the water was broken up and there was no reflection. We put the reflection of the mountains into this lake to make it really spectacular."

Running for three years, two months, fourteen days and sixteen hours, Forrest finally realizes that his mama was right when she said, "You got to put the past behind you before you can move on." He decides to go and find Jenny and ends up on the very bus stop bench where we have seen him sitting and telling his story throughout the film. Once he learns how near the bus stop is to her apartment, Forrest jumps up and takes off running. Jenny greets him with a radiance and inner calm we have not seen before. Forrest is surprised to discover that she has become a mother, and even more surprised to find that her young son is named after his father – himself. The three are united as a family and return home for good. Their bittersweet peace is shattered, however, when Jenny – seriously ill with a mysterious virus – dies. As Forrest visits her grave to bid her farewell, white birds fly from the giant oak under which she is buried, beautifully symbolizing her freedom at long last. "The birds flew off as they were supposed to," Rosenbaum recalled, "and Tom delivered his lines beautifully and very movingly. Everything was wonderful – except the sky. It was really flat and dull, which sort of killed the magic of that particular moment. So Bob Zemeckis had us fabricate a sky. We had to extract a matte on the oak tree, match the camera motion of the shot, and match all the lighting. As a director, Bob has learned how to use technology to great advantage. He can film a shot; and he knows that if it's not quite right, that's not a problem. He has a little voice in the back of his head saying, "I'll let the computer guys fix it later.'"

Among the wartime wounded Forrest saves from certain death is his commanding officer, Lieutenant Dan Taylor (Gary Sinise), who survives, but loses his legs as a result of injuries.

While some of the post-amputation shots employed standard movie simulations – such as having Sinise sit on his knees in a wheelchair with a false bottom – a number of showcase scenes depicted his physical disability with utter conviction through the employment of digital technology. For a scene in his character's seedy New York apartment Sinise wore stockings made of bluescreen material so that mattes could be generated to remove the lower part of his legs from the plate.

"Computers are affording filmmakers more and more options," concurred Ken Ralston. "Not everyone is in the position Bob Zemeckis is, of course; but if they consider themselves artists and have a very specific vision in mind for a film – like a painting or a sculpture – they now have the tools to get that on film. I think directors will start using computers more in this kind of way – not for blowing people's heads off, but to create a more beautiful sunset or to make the quality of the green in trees a little greener. The more versed filmmakers get with the computer as a tool, the more they will use it."

Anything in the shot that was covered by the actor's legs – flooring, furniture, even moving objects such as wheelchairs or other people – had to be pieced together and filled in to replace the hole left in the background by the matte.

Forrest Gump ends as it began, with a single white feather dancing across a splendid blue sky – a delicate image of both determination and chance. "I think Bob felt the feather represented forrest in a kind of lyrical moment," Ralston commented. "It looks happenstance, and yet the feather almost touches him. Is fate leading this feather or is it just the breeze? We knew we couldn't achieve the effect we wanted with a real feather on location. It would have been impossible to make it do all those graceful, beautiful moves. So we did it in a pretty traditional way. We started with background plates shot on location in Savannah, Georgia. The first part of the shot was filmed about ten blocks away from where Tom was sitting at the bus stop. We had a huge industrial crane for the opening of the shot, with a gyrosphere setup for a Vistavision camera so it would be relatively steady. It was remote control operated from below. We came up with some moves we thought would work and the operator choreographed the camera. We filmed several versions, and got some good stuff for the background. Then we needed a moment where the camera panned up and saw a full sky so we could do our blend and come back down to where Tom was. We got that worked out, knowing that the timing for the opening credits would be about a minute and a half. It was just a matter of working out the choreography with the timing we wanted – and endlessly rehearsing it."

Once the plates were obtained and joined together, Ralston contemplated the least expensive, easiest way to achieve the feather photography, and decided to do it bluescreen. "It was much simpler to shoot a feather bluescreen than to come up with a computer generated feather. There are some delicacies on feathers that I didn't even want to experiment with in CG. So I just hung a feather from a piece of monofilament and put a fan under it. I sat there playing with it, trying to get beautiful movements. We shot it at 72 frames a second with the camera locked off so the feather was as big in frame as we could make it. Then Peter Daulton and I broke down the sections we wanted to use out of all the film we had shot. So what the audience sees is not just one long take of a feather dancing around, but different takes of the feather blended together into one continuous shot." Peter Daulton employed an in-house 2-D animation program to further choreograph the feather, thus creating the effect of its floating up and down and being affected by wind gusts and drafts. The lighting on the feather was matched to the background by Linda Siegel, who then altered it as the feather moved across the sky, adding reflections and shadows where needed.

In the opening title sequence, the feather drifts down and settles at Forrest's foot. "The only way we could get that to work," said Ralston, "was to have that feather in the shot the whole time that Tom was being photographed for the scene – have it glued to his shoe. Then we had to conceal it by going in and taking some of the texturing from around the bricks and using it to paint on top of the feather, creating art pieces that looked like his tennis shoe and matching that to the shot. Once Tom grabbed the feather, we were okay; but until then, we had to make it invisible. Leah Anton had to paint the feather out, which took months to do. Our bluescreen feather had to match color-wise, size-wise, and brightness-wise with the real feather that was sitting by Tom's foot. It was an especially critical match, so that when it turned into the real feather you wouldn't see it pop out and look artificial."

At the end of the movie, the feather falls from young Forrest's copy of *Curious George* as he waits with his father for the bus to take him to school. It rests on the ground for a moment and then, as the bus drives away, floats up and skyward signaling the poetic end to a film that reached a place in the heart of nearly all who saw it. The release of *Forrest Gump* marked the beginning of a kind of phenomenon – Gump, as the advertisement read, happened. Few contemporary movies have touched audiences with the power and pathos of *Forrest Gump*, "I think everybody comes away from the movie with his or her own little emotional secret," said Robert Zemeckis. "There seems to be something in this movie that everybody can respond to, regardless of background or age. I haven't spoken to any two people who share the same exact feeling about it."

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VIDEO BEAT
ATTACK OF THE 80-FOOT STONES

article by Marcus Miller

The Rolling Stones are back. And bigger than ever – literally.

In their new video, Love Is Strong, director David Fincher makes giants of the venerable rock group in a visual feast that makes dramatic use of hand-held camera work and flamboyant digital enhancements. Standing ten stories tall, the Rolling Stones look utterly convincing as they sing and dance and strut their stuff in the concrete canyons of New York City. Remarkably, Fincher and crew put the revolutionary video together – from conception to completion – in less than two months, compositing nearly one hundred shots in less than three weeks.

Instrumental to the video was Fred Raimondi, an effects supervisor at Digital Domain who was finishing work on *True Lies* when Fincher contacted him regarding Love Is Strong. Having teamed with the director on six previous projects – including a showcase series of Nike commercials – Raimondi welcomed the opportunity to work with him again. "David is the type of director who likes to take things further than you think they could go. We have this friendly competition going where he tries to push me and I try to push him."

The solution to making the video believable and interesting, yet simple enough to be achieved within the time frame allowed, was to rely exclusively on digital compositing techniques. "Every shot in the video – except one swish pan with no people in it – is a composite," Raimondi observed. "There are no miniatures, no motion control, no forced perspectives. The people were just added in postproduction. And the really amazing thing is that there isn't one composite in the video that has more than two elements in it. Each has a foreground and a background, period." The challenge – and the payoff – would come in how cleverly the crew could manipulate those two elements.

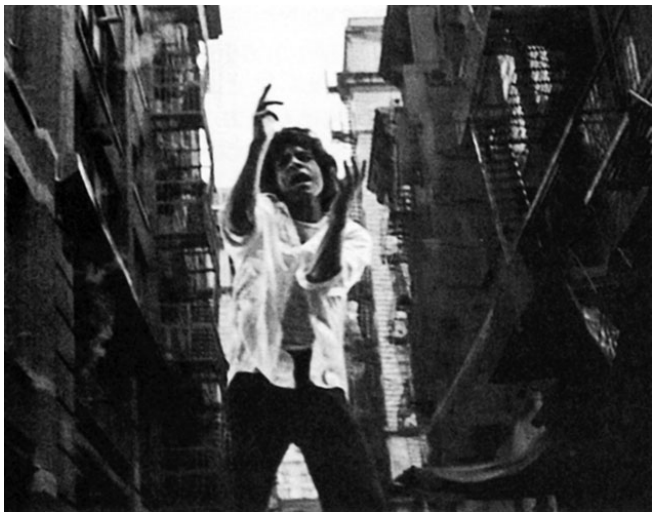
Once his concept was approved by Virgin Records, Fincher gathered a crew and was off to film background plates in New York while Raimondi marshaled his postproduction resources at Digital Domain. The plate shoot – largely off-the-cuff – was completed in just a week. At Propaganda Films in Los Angeles, Fincher and editor Jim Haygood then cut the footage to music without benefit of the foreground elements – namely, the band members and other oversize participants. "David just previsualized what the foregrounds were going to be," noted Raimondi. "'This will be a Mick shot. This will be a Mick and Keith shot' And so on."

After the cut was finalized, Fincher gathered a mini-crew at Digital Domain for an intensive four-day technical rehearsal. With a videotape of the edited background plates, a few lights and a video assist system, Fincher quickly blocked the action with stand-ins and worked out camera angles and lighting positions that he would later replicate when shooting the Rolling Stones. Because of the thorough preparation, greenscreen photography of the Stones on stage in Toronto – where the band was rehearsing for its 'Voodoo Lounge' tour – was accomplished in only a few days. Additionally, the careful preplanning enabled director of photography Garry Waller to match the lighting of the background plates impeccably.

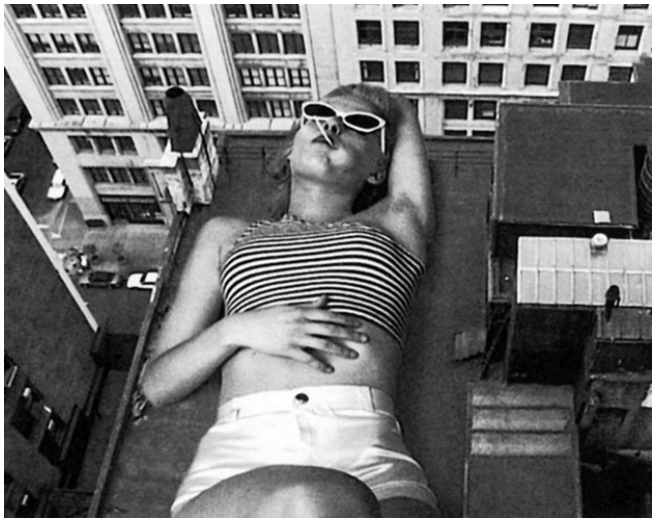
Although the New York background plates were characterized by hand-held camera moves, the greenscreen elements were shot completely locked off. Duplicating the plate moves in the foreground stage work was deemed unnecessary – even disadvantageous – since Discreet Logic Flame and Flint systems, together with proprietary software developed by Digital Domain, could be used to track camera moves in the background plates and reproduce them precisely on the fixed foregrounds. Apparent camera movement in the foreground plates were actually accomplished with clever on-stage trickery. Scenes featuring Mick Jagger striding down the street towards a camera that is trucking away from him, for example, were achieved by simply putting the performer on a treadmill in front of the greenscreen. Later in post-production, Phil Di Giorgio and Martine Tomczyk enhanced that sense of movement by isolating some of the background elements – most notably an overhead stoplight – and bringing them into the foreground. For another shot, in which the camera moves down a thoroughfare catching glimpses of giants frolicking on the side streets, Fincher placed the actors on a rotating turntable to compensate for the perspective shift in the plate.

While Fincher was busy in Canada with the Rolling Stones, Raimondi and his crew began preparing the background plates for compositing. Because the video was going for a realistic, documentary look – with unsteady, often jerky, camera work – extensive computer tracking was required in order to pull complicated traveling mattes for rotoscoping and foreground compositing. “I had a team of about eight people, each tracking camera motion on four or five shots a day.” In about a week, Raimondi had all the tracking information analyzed and put into a common database so that it would be easily accessible when it came time to composite. “When David returned, I spent a lot of time with him going through the shots, clarifying what had to be in front of what and who was going behind what – those kinds of calls. All that information was included in a shot bible prepared by our producer, Molly Naughton. Because everything was so well organized, anyone could come in, refer to the bible, pull up the tracking data and, on any given shot, go to work on the composite.”

Since digital systems can automate basic compositing tasks quite easily, Raimondi and his crew were able to spend much of their time on more creative aspects of the shots. “We often had problems on shots because there weren’t any foreground objects to sell the scale,” Raimondi noted. “So in many cases we simply added them. Taking objects out of the background – from traffic lights and trees to entire buildings – and putting them in the foreground helped to establish the size of the people. We did a lot of after-the-fact roto work.” One such shot featured a young woman, carrying flippers and a beer bottle, hauling herself out of the East River. “Originally I had put that together with the girl in the foreground by matting out the top so that when she put her hands down and came up, her head went under the structure that the camera was on. But David said: ‘No, no, no. Try putting her behind it.’ I thought that would never work; but when I put it together, I was proven wrong. My favorite shot in the whole video is the girl standing outside the window with a cigarette. I got to employ just about every compositing technique known to man on that one. Parts of her had to look like they were being seen through glass, plus there was smoke to deal with – which is always tricky – and the camera was pushing in so there were perspective shifts.”



To make eighty-foot-tall giants of the Rolling Stones for their black-and-white video, Love Is Strong, effects artists at Digital Domain produced nearly one hundred composites incorporating greenscreen stage photography into background plates shot documentary-style in New York City.



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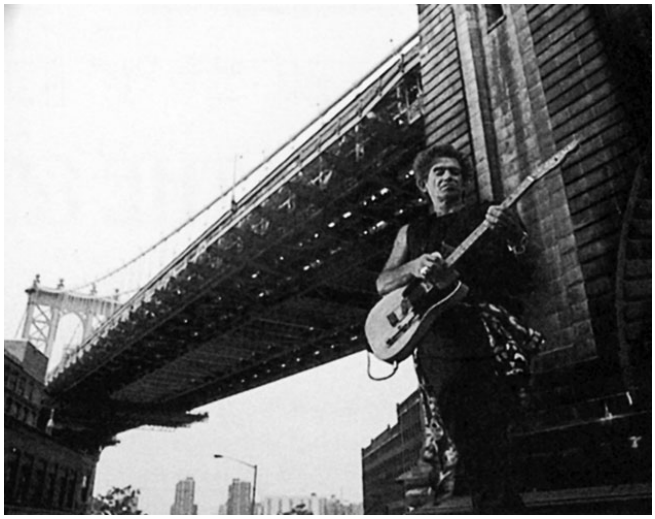

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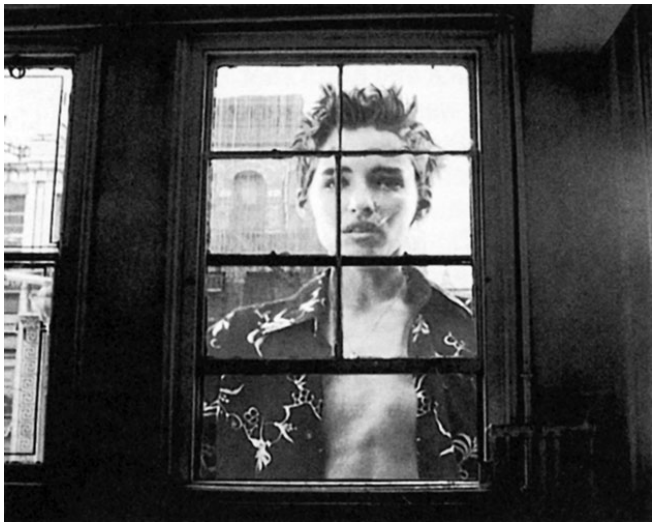
Although the intent had always been to make a black-and-white video, the original photography for all elements was in color. “David transferred the shots in black-and-white – except for a few where we knew we needed to do foreground removal. I had him leave the color in those, because in some cases we got lucky and were able to use the color of the objects in the foreground to do self-deriving mattes. On those few shots, we removed the color during the composite process.”



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Creative suggestions were generally welcome. For a shot of Charlie Watts playing water towers as drums, Fincher had originally filmed the drummer just striking his knee. Later, however, Raimondi hit on the idea – executed by Gray Marshall – of rotoing one of the water towers in the background plate and making a snare drum out of it. By strategically placing still another cut-out tower in the shot, they were able to equip Watts with a cymbal.

To make eighty-foot-tall giants of the Rolling Stones for their black-and-white video, Love Is Strong, effects artists at Digital Domain produced nearly one hundred composites incorporating greenscreen stage photography into background plates shot documentary-style in New York City.

Digital enhancements also added to the sense of reality. “In a shot where a girl is standing in the street and the camera turns sharply on its side, we added lots of motion blur and incorporated the girl’s shadow on the ground and people walking in front of her. Whatever we could eke out of the elements was what made the shot.” Another brief scene reveals a giant woman standing ankle-deep in the Central Park lake where she sweeps her hand through the water, creating concentric ripples. After integrating the actress into the background plate, Raimondi added a complex reflection in the water, paying close attention to density and lighting. The surface ripples were to prove more problematic. “I created my own ripple pattern with a three-dimensional displacement map. First, I had to define what the actual displacement was going to be – mostly by simple trial and error – getting the speed of it right, plus the sizing and the lighting. Then I applied it to the lake and her reflection so that the ripples appeared to occur in concert with her movement while still remaining true to the surrounding environment.”

A scant three minutes long, the Love Is Strong video has nonetheless added an exciting – and fitting – new chapter to Hollywood’s legacy of onscreen giants. After all, who better to usher in this new age of giants than the greatest and biggest rock-’n’-roll band on the planet.

QUICK CUTS
THE RETURN OF THE VAMPIRE

article by Don Shay

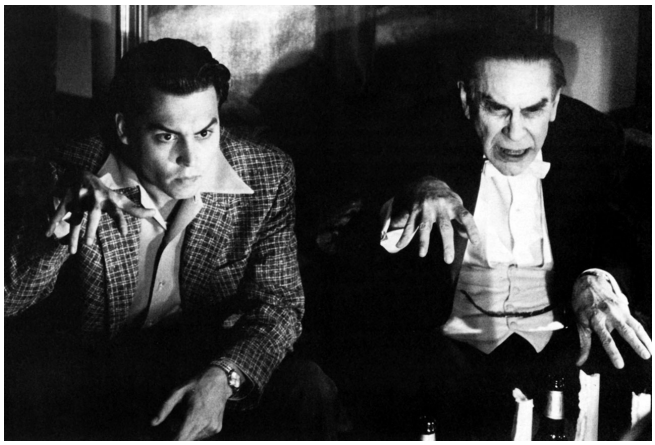
Ed Wood was a filmmaker of boundless enthusiasm, hobbled only by a shortage of funds and any semblance of discernible talent. Bela Lugosi was a film star at the nadir of his life and career, an aged Hollywood has-been who was frail and broke and addicted to morphine. Together they would collaborate on a trio of fifties genre movies so appallingly awful that one, at least, would gain widespread recognition as the worst film ever made.

The strange symbiosis binding these unlikely confederates is the heart and soul of *Ed Wood*, the latest examination of humanity on the fringe by mainstream moviemaking's most eccentric practitioner, Tim Burton. Two-time Oscar-winning makeup artist Rick Baker – a devotee of the Universal horror films that had made Lugosi a household name in the thirties – learned of the project through a small item in the motion picture trade journals. "It said that Tim Burton was doing a movie about *Ed Wood* and that Martin Landau was going to be playing Bela Lugosi," recalled Baker. "I thought, 'I have to do this!' So I wrote a letter to Tim – whom I'd met years ago when he was still an animator at Disney – and I said: 'I don't know if you're planning on doing a Lugosi makeup; but if you are, I really want to do it.' A short while later, I got a call from Denise Di Novi, the producer, and she said: 'We're excited that you're interested. Tim really wants Martin to be Bela Lugosi.'"

To prepare for the assignment, Baker reacquainted himself with Lugosi's films – particularly the later ones when the actor was well past his prime – and studied countless still photographs. Though Martin Landau had been recruited, in part, for his passing resemblance to Lugosi, Baker quickly realized that there were more differences than similarities in the specifics. "Lugosi had a distinctive nose and cleft chin – and his ears were quite a bit larger than Martin's. Those things I could duplicate with appliances. More difficult was the fact that their faces were shaped quite differently. Lugosi's was rather round, while Martin's is long and rectangular. Plus their mouths were totally different. Martin has a very full upper lip and very little lower lip. Lugosi had just the opposite."

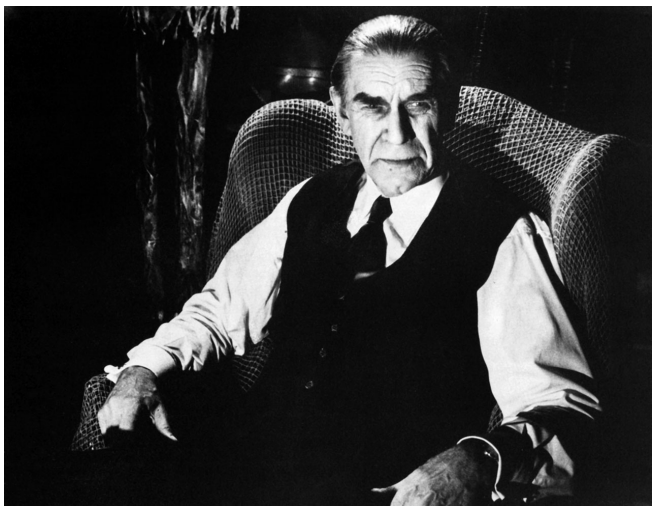
Baker set about devising a makeup that would require as few appliance pieces as possible to transform Landau into the aged horrormeister. "I could have done a makeup that looked more like Lugosi in stills, but I didn't want to restrict Martin's facial expressiveness with a lot of rubber. We were all counting on his acting to complete the illusion." After first making a casting of the actor's head, Baker went to work with clay and sculpting tools. "It was a fairly simple makeup – just a chin with a little cleft, and a piece to cover his full upper lip. Then there was a nose and ears – also a hairpiece and some eyebrow hair laid in. I made a lower lip piece, as well, but I knew it would be a pain because lip pieces always get the most use and require the most touchup. I asked Martin about it and he preferred not to wear it. Instead we made a dental appliance that clipped onto his teeth and forced his lower lip out without his even having to think about it."

When the makeup was completed and ready for testing, Landau was summoned to the Baker studio for the first of many sessions that would transform him into the embodiment of Bela Lugosi. "Martin was wonderful – fully cooperative and very professional. While I was doing the makeup, he sat in the chair doing Lugosi – and I was coaching him a bit on his expressions since he hadn't seen nearly as many Lugosi films as I had. One of the things he was doing was opening his eyes really wide. I said, 'When you think of Lugosi, you think of his eyes – but actually they were quite squinty.' So he did that and it helped a lot. I wasn't quite finished by the time Tim and Denise arrived with the film crew, so I asked them to wait outside. 'I want you to see Bela, not Martin getting in makeup.' Since there was so little rubber on Martin's face, I just matched the color of the rubber to his skin – without much of a base on him at all – and added a few things to age him a bit. The makeup looked very real, even in person, and – from a three-quarter-angle, particularly – it looked a lot like Lugosi."



Bela Lugosi (Martin Landau) demonstrates a menacing pose for Ed Wood (Johnny Depp) in the latest film from director Tim Burton.

When the work was finished, Burton and Di Novi were invited into the room. "We positioned Martin three-quarters to the door – and when Tim came in, it was like: This is a makeup?! I've never seen a makeup like this. This looks real!'" The film test was shot in color with Landau delivering Lugosi's *Bride of the Monster* speech and performing other bits of dialogue and action. The results were surprising to all. "The makeup looked good and it looked real, but it just seemed odd to see Lugosi in color." In nearly one hundred motion pictures, Bela Lugosi had appeared only once in color – and that in the eminently forgettable *Scared to Death*. Upon viewing the color makeup test, Tim Burton decided at once that *Ed Wood* had to be shot in black-and-white.



Landau was transformed into Lugosi via prosthetic makeup created by Rick Baker and applied on set by Ve Neill.

Although Rick Baker had looked forward to applying the Lugosi makeup during production, by the time shooting began, he was deeply immersed in *Baby's Day Out* and had to relinquish his on-set involvement. Application of the makeup fell to Ve Neill – herself a two-time Oscar winner who had worked on three prior Tim Burton films and would be doing extensive makeups on the other *Ed Wood* characters as well. Her initial application of the Lugosi makeup was a couple of days before Landau was scheduled for his first scenes. "I had never worked on a film that was entirely in black-and-white," said Neill, "and so the first time I did the test on Martin, I did it pretty much as I would have for a color film. But when we shot it on black-

and-white stock, there was very little definition in his face and he looked much too healthy. Tim took one look at it and said, 'He's got to be paler and he's got to be darker around the eyes!' Rick gave me the business about this – kiddingly – because every time I do a makeup for Tim, the characters wind up having white faces and black eyes. But through several tests, we found that the more contrasty we made the makeup – the lighter the skin and the darker all the definition and character in the face – the better it looked on film."

As Baker had during the sculpting process, Neill referred often to photographs of Lugosi during the makeup application. "I'm a horror movie freak, so I've seen all of his movies a million times. But even though what Bela looked like was locked in my head, the photos were important because I was trying to take features from one person and put them onto another whose face was completely different. Certain things had to be exaggerated to enhance the likeness – the arch of his eyebrows, for example." A significant contribution to the illusion was the darkening of Martin Landau's prominent white teeth. "If you think about it, you never saw Bela Lugosi's teeth. His lips were always wrapped around them. So I thought if we darkened Martin's teeth with some tooth enamel that they would appear to be always in shadow. That really helped a lot." Neill also used collodion and paint to simulate collapsed veins and needle tracks on Landau's forearms for two scenes in which Lugosi's twenty years of morphine addiction are graphically in evidence.

Having done stark black-and-white makeups for such quintessential Tim Burton characters as Beetlejuice, *Edward Scissorhands* and the Penguin – all in color films – Ve Neill gained some insight into the director during the making of *Ed Wood*. "I finally got it after all these years – Tim's pictures are actually black-and-white movies shot in color. Tim really loves black-and-white. I think if he had his way, he would shoot all of his movies in black-and-white. I like it myself – it alters the feeling of a film completely. I doubt if *Ed Wood* would have had the same impact if it had been shot in color. Certainly the Bela Lugosi character would not. In black-and-white, he looked like the Bela we all remember from his pictures. Rick designed a very clever makeup and the resemblance was quite uncanny when it was applied and painted. Then Martin delivered an incredible performance. That was what sold it."

VIDEO BEAT
CASTING ANOTHER SPELL

article by Estelle Shay

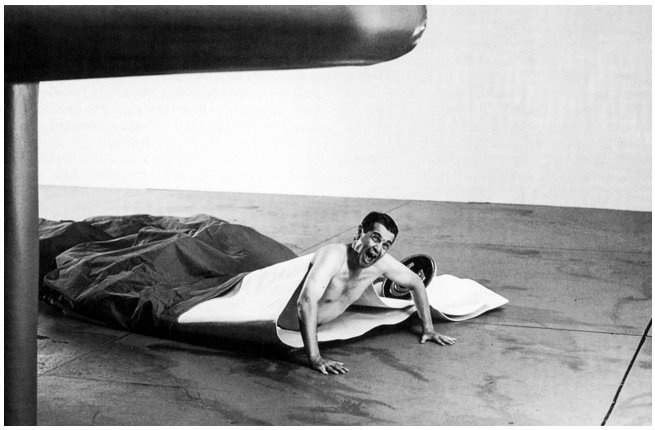
When Home Box Office aired its supernatural detective movie *Cast a Deadly Spell* in September 1991, viewer response was sufficiently favorable to prompt immediate plans for a sequel. Now, three years later, producer Gale Anne Hurd and writer Joseph Dougherty have reteamed for an even more outrageous send-up of the classic film noir genre. Witch Hunt, directed by Paul Schrader, marks the return of hard-boiled private eye H. Phillip Love-craft and a whole new cast of shady characters.

The year is 1953 and, like its predecessor, the sequel is set in a fictional Los Angeles where everybody dabbles in magic – everybody, that is, except Phillip Lovecraft. Sexy film star Kim Hudson (Penelope Ann Miller) hires the gumshoe to trail her philandering husband, studio mogul N.J. Gotlieb (Alan Rosenberg) whom she suspects of having an affair. When Gotlieb meets an untimely and supernatural demise Senator Larson Crockett (Eric Bogosian) – grooming himself for the presidency on a wave of anti-magic fervor – conveniently pins the crime on Lovecraft's witch friend and landlady, Hypolita Kropotkin (Sheryl Lee Ralph). Battling zombies, ravens and the supernatural powers of his old nemesis, Finn Macha (Julian Sands), Lovecraft unravels the mystery and exposes the real villain just as Kropotkin is about to be burned.

Hired to oversee the visual effects was Michael Muscal, whose previous credits include *Honey, I Shrunk the Kids*, Re-Animator and the HBO remake of *Attack of the 50 Foot Woman*. Muscal divided the effects work – both digital and optical – among several companies including Fantasy II, Perpetual Motion Pictures and Pacific Title Digital. Criswell Productions was engaged to provide a number of prosthetic devices.

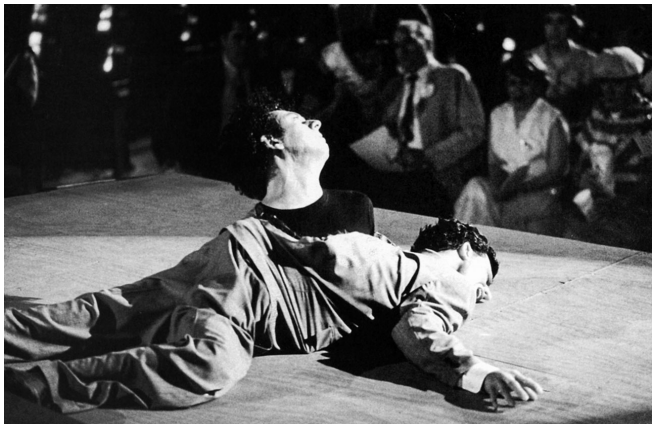
The pervasiveness of magic in this fictional Los Angeles is established in Witch Hunts opening in which Lovecraft visits a barbershop on behalf of a client to settle a little matter of $7000 in back alimony. As he zeroes in on his culprit, mirrors shake, bottles of nail polish begin blowing their corks and a barrage of straight razors and scissors fly out of cabinet drawers toward him. "The effect was mostly done by flying the real objects and then doing wire removal," said Muscal. "But there was one shot – a down-angle where a pair of scissors and a razor fly into frame, twirl around and shoot out – that was digitally generated. PMP modeled three-dimensional CG scissors and the razor, then animated them. We composited those elements into our scene."

Recruited by Kim Hudson to trail her husband, Lovecraft arrives at his studio just in time to catch another display of magic as – under Gotlieb's orders – Kropotkin summons Shakespeare from the sixteenth century to the twentieth to serve as a movie dialogue writer. The illusion – one of the film's most elaborate – consisted of six shots accomplished by Fantasy II. The sequence begins as Kropotkin sprinkles a magic circle of sand on the ground and utters an incantation appropriately borrowed from Macbeth. As she speaks, the words visibly flow from her mouth in a stream of three-dimensional letters. Caught in a cyclone of sand, they reassemble in a weird checkerboard pattern, form the shape of a man, and finally coalesce into the stunned Bard. "Shots of the letters streaming out of Kropotkin's mouth were accomplished using computer graphics," explained Muscal. "We could have taken the simpler approach of traditional animation, but we really wanted the letters to be modeled in 3-D so that they would have depth." Using an Old English font, the Fantasy II digital team colored and textured the letters to resemble carved stone before delivering the data to Pacific Title Digital where it was recorded out to film and returned for optical compositing with the background. "We decided to finish the effect optically because it gave us a little more control." A digital morph was used to achieve the final transformation from the computer generated letters to the actor playing Shakespeare.



A supernatural spell shrinks film studio mogul N.J. Gotlieb (Alan Rosenberg) to Lilliputian proportions in the HBO telefilm Witch Hunt.

Gathering proof of Gotlieb's infidelities proves tricky for Lovecraft. Following the producer to his mansion, the detective settles in for an all-night stakeout when he finds himself staring through his rain-splattered windshield into the glowing eyes of a raven perched on the hood of the car, a small red snake clutched in its beak. Mesmerized, Lovecraft sinks into a hypnotic sleep. The rain, the raven and Lovecraft in the foreground were all shot as separate elements that were composited into the background by Fantasy II. To emphasize Lovecraft's spell-induced point of view, the rain was shot highspeed, resulting in rainfall that fell unnaturally slowly. Criswell Productions constructed an animatronic raven that had head and beak articulation. "We first tried a real raven with a rubber snake in its mouth," Muscal recalled, "but the bird wasn't very cooperative. We couldn't get it to keep the snake in its mouth for more than a second. Then we went with a live snake in the beak of the animatronic bird – which actually added some excitement to the shot by curling up and looking as if it was about to strike."



An evil alter-twin emerges from Senator Larson Crockett (Eric Bogosian) in the Gale Anne Hurd production directed by Paul Schrader.

Gotlieb's bizarre death required another noteworthy gag. Sequestered in his private office, feet up on his desk, Gotlieb has just completed a phone call when he notices his feet retreating from the desk edge. With dawning horror, the producer realizes that he is shrinking like a tire with a slow leak, his clothes billowing about him. The scene comes to a grisly close when a six-inch Gotlieb crawls out from one suit cuff and is pounced upon by his two Great Danes. A deflating suit designed by Criswell Productions was used to accomplish much of the gag. "It was a very realistic suit," said Muscal. "All we had to do was let the air out of it for two shots, then zero in on specific deflated body parts like the arms and legs. Criswell also built a prosthetic hand which we shot shriveling up and disappearing into the sleeve." Because the suit was essentially headless, digital manipulation was required to add the actor's real head to the shots. "We filmed our actor from the neck up, full-frame against a bluescreen. Then PMP scanned him into the computer and digitally composited the head onto the shrinking suit, repositioning and tracking it to move in sync with the collar."

Later in the film, as Crockett prepares to burn Kropotkin before a frenzied mob of political supporters, Finn Macha – whom Crockett has double-crossed – puts a spell on the crooked senator that unleashes his personal demon. Crockett spits up a live toad and falls to the ground face down. Then his suit and skin split open and his evil alter-self emerges. Rather than construct an elaborately demonic alter-Crockett, Paul Schrader made the aesthetic decision to present Eric Bogosian in black jeans, black T-shirt and wild curly hair – a persona that quite closely resembled Bogosian himself. "Eric actually had less makeup on for the alter-Crockett than he did playing the senator," Muscal commented. "For the senator, we padded him up a bit and gave him a Nixon-like hairstyle." The emerging alter-Crockett was one of the film's more low-tech effects. "We used a hollowed out window-store dummy that was fitted with a prosthetic head built by Criswell to resemble Bogosian as the senator. The dummy had a hole in its back and was positioned on the stage lying down over an opening in the floor. All Bogosian had to do was get underneath the stage, crawl up into the dummy and break through a pre-scored slit in the back. It was definitely one of our cheesiest effects, but it worked great."

In a final bit of unfinished business, Lovecraft confronts Macha, but cannot bring himself to use the supernatural powers that he has renounced for ethical reasons. Possessing no such reservations, Kropotkin intercedes with a bit of sorcery. As Lovecraft opens his mouth, a raven emerges, plucking out the villain's evil eye. For the sequence, a real raven replaced the animatronic one used earlier in the film. "We shot it in front of a bluescreen," noted Muscal, "and tracked, positioned and reduced it in the shot. We composited two of those bluescreen raven shots with background plates of Lovecraft and Macha. For the closeup of the raven plucking out the eye, we again used the real raven which had been trained to attack a prosthetic head built by Criswell. It was not an exact replica; but the shot is only twenty frames long, so you barely have time to register what you're seeing."

Limited by significant budgetary constraints, *Witch Hunt* tested the resourcefulness of its effects providers. "We ended up with thirty-seven visual effects shots," said Muscal, "and thanks to clever editing and a willingness to go with whatever worked – whether it was digital, optical or simple makeup effects – we got the results we wanted."

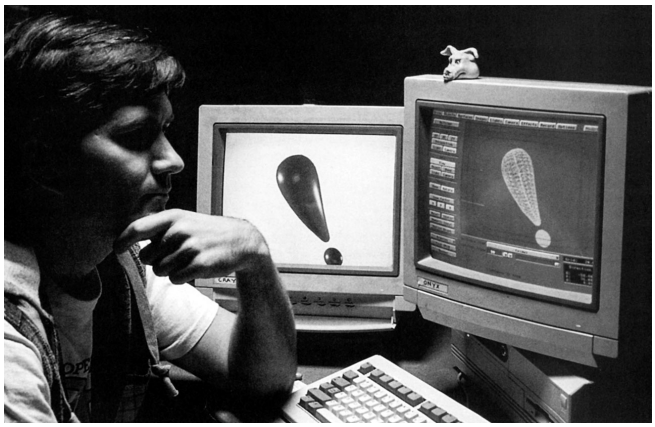
COMMERCIAL SPOT BYTE-SIZE COOKIES

article by Paul Mandell

The hottest new item on Will Vinton Studios' demo tape is a thirty-second commercial for Chips Ahoy! cookies. The high-energy spot combines forced-perspective miniature sets, roving motion control photography, replacement animation a la George Pal's *Puppetoons*, and computer animation in an art deco milieu keyed to Big Band music of the forties.

The digital performance was something new for the studio, whose trademarks have been Claymation and anthropomorphic raisins. "We were chosen on the strength of our reputation for character animation, not computer graphics," stated director David Daniels. "The strength of the spot lies in the art direction and character performance. All our people working in clay inadvertently had the best training for computer animation because we were trained to think dimensionally."

Choreographed to the bouncy Swing, Swing, Swing, the central character of the spot is a shiny, royal blue exclamation point – nicknamed 'the pogo' – which flies into an art deco theater and gesticulates to the beat of the music. *Puppetoon*-like trombones play themselves on music stands, and the Chips Ahoy! logo is boldly displayed on the stage floor. As the camera arcs and flies into the set, the pogo 'atomizes' into a revolving spiral of cookie labels, much like the stacked record spindle of an old juke box. Another blue pogo flies through the portal of the Chips Ahoy! logo and enters an exquisite deco room where chocolate chips sit on cushy blue chairs and a pulsating gramophone ejects cookies through its bell. When the center cookie transforms into a constellation of chocolate chips, the face of one chip fills the frame with the inscription '1000 Chips in Every Bag.' Suddenly, the camera recedes and the chip turns into a chocolate pogo whose dancing reflection is seen in a myriad of wall mirrors. Exclamation points dance and jump off the mirrors as if they were diving boards and land on a field of chocolate chip cookies. One of the exclamation points bounces off the field of cookies transforming from a chocolate exclamation point to a blue exclamation point. It then comes out of the bag and posits itself back onto the Chips Ahoy! logo.



Key to the spot was the illusion of an endless camera move as the blaring music propels the computer generated exclamation point into connective art deco environments – forced perspective miniatures designed by art director Paul Harrod. "We'd been working in that medium for the last ten years," Daniels noted. "We had developed what we call Corporate Expressionism – doing wacky things with expressionistic sets and 'corporatizing' them so they're palatable for commercial purposes." Sets were photographed motion control with a

snorkel lens on a camera which had a yaw, pitch and roll head.

Director David Daniels examines a digital exclamation mark featured in a Chips Ahoy! commercial produced by Will Vinton Studios.

Computer generated images were integrated into the forced perspective environments, a task that required match-moving digital elements with the motion control photography. Daniels and the computer team, headed by CGI producer Matthew Brunner, started with a computer generated animatic which allowed the camera unit to reference their motion control shots. “We would build, in the computer, a fake set which was the same dimension as the real set,” Brunner explained. “We overlaid that visually to match the camera moves by eye, as opposed to importing our information on motion control rigs directly into our digital camera move.”

“We shot motion control on the miniature sets, did a video transfer, and scanned that into the computer,” Daniels elaborated, “placing the pogo character onto the background. That was a dirty roto, just to give us an idea of the plate movement relative to the character. All the fine-tuning and actual compositing was done on the Henry.”

Two animation software systems were used: Lightwave on the Video Toaster, and Animation Master on the PC. While cost effective in the long run, employing the two relatively low-end systems did require extensive testing to realize a suitable final shot. “A good example was the CGI scene of the chocolate chip bearing the words ‘1000 Chips in Every Bag,’” Brunner noted. “We did a version of that on both software systems – two totally different approaches. In post, we put them up side by side and decided which one worked best for the spot at that particular moment. The modeling was done on Animation Master and then transported to Lightwave. Once we went on Lightwave, the work progressed very quickly. Two-thirds of the commercial was done on that system; but we mixed the two platforms quite a bit. We used whatever tool got the job done for each particular element, and stirred the results together in post.”

Karen Hout employs replacement animation to energize a gramophone for the spot.

The mixed bag of techniques employed in the Chips Ahoy! spot enhanced its nostalgic concept. Aside from blue pogos and chocolaty delights – animated by digital artists Larry Bafia, Galen Beals, Doug Aberle and Vince Backenburg – Karen Hout did replacement animation of *Puppetoon*-like trombones and the expanding gramophone. “The replacements for the gramophone were roughed out first in wire,” said Hout, “and manipulated with the help of a frame grabber – a computer video system that can store a collection of images which can then be flip-flopped, just as animators do in traditional cel animation. Because of the motion control rig, the size of the set and the lighting setup, the replacements had to be positioned through a window in the back of the set. My visibility was limited, so each piece had to ‘click’ into position without any fussing. The neck and bells of the gramophones were all interchangeable, giving me more range of movement without having to build as many pieces.”

The Vinton Studio model shop also created stop-motion cookies that sailed around the deco living room. Made primarily of wax, the cookies were suspended on rods that connected to a sheet of plexiglass. A positive print of the stop-motion was scanned into the computer and combined with computer generated chips. “Computer images appear more interesting when used in the context of other kinds of looks and textures that are not computer-looking,” Daniels commented.

In some instances, computer elements were generated to exactly match physical props. “An interesting example was the cookie that came out of the gramophone,” Brunner said. “It was a large prop cookie that we could zoom in on. Once that was filmed and computer-scanned, we recreated the chocolate chips in the computer. Those were produced on Animation Master and matched in position, size and velocity to the original cookie. In the commercial, when the cookie dissolves and crumbles, we go from hand-made chocolate chips to CGI chocolate chips – transitioning from a physical element to a computer element. The lighting was essential, and material surfaces were very important. There were fifty or more forms of chocolate that we explored with the client for the correct subtleties of color and texture. We spent weeks working with different chocolates.”

The centerpiece of the commercial occurs in a miniature forties-style ballroom. As the camera pulls back, the inscribed chocolate chip reveals itself to be the ‘dot’ of the exclamation point. In the background are eleven wall mirrors in deco frames, each carrying a reflection of the pogo as it dances to the beat of a drum solo. The mirrors flap downward and transform into the rays of a flying solar pattern. “Originally, the mirrors were conceived as bendable reflective flower petals,” Daniels noted, “but there was no way that we could bend mylar flower petals on a real set and really make the animation accurate. So it became a CGI element out of necessity, and the petals became mirrors.”

As it is throughout the effects industry, digital capability is booming at Will Vinton Studios. “Our facility is probably unusual in comparison to others,” Brunner commented. “We’re not setting ourselves up as a CGI house; we’re looking at it as just another option we can offer a client. Our trademark has always been Claymation, and we cannot see forsaking that in favor of the computer revolution.” Having jumped on the computer bandwagon with Chips Ahoy!, however, the Vinton team is perhaps most proud of its achievement in bringing a sense of style, fun and pizzazz to something as inherently characterless as a chocolate chip cookie. “There used to be a test at Walt Disney in the thirties,” Daniels concluded, “which was the ‘sack of flour’ test. If you could animate a blob with four corners and give it some pathos, that was the art of animation. I think the Chips Ahoy! spot was our sack of flour.”

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